MECHANICS · AUTOS · HOMEBUILDING

POPULAR SCIENCE

January 35¢

MONTHLY

JANUARY

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

Dispose of such fire hazards as Christmas trees, oil-soaked rags and other trash.

FEBRUARY

S	M	T	W	T	F	S
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27	28					

Overhaul tools you'll be using to repair lawns and start your flower gardens.

MARCH

S	M	T	W	T	F	S
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13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Hose down your car now. Those chemicals used on icy streets may cause rust.

APRIL

S	M	T	W	T	F	S
					1	2
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Get indoor jobs, such as repairing the faucets that leak, done on a rainy day.

MAY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
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29	30	31				

Antifreeze can be removed now. Flush radiator out and put in rust inhibitor.

JUNE

S	M	T	W	T	F	S
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26	27	28	29	30		

Point up cracks in masonry, fix damaged gutters and open those attic windows.

JULY

S	M	T	W	T	F	S
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17	18	19	20	21	22	23
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31						

Driving in dust shortens engine life. Has your air filter been cleaned lately?

AUGUST

S	M	T	W	T	F	S
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28	29	30	31			

Batten down for big fall blows. Trim dead tree limbs, tighten loose shutters.

SEPTEMBER

S	M	T	W	T	F	S
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Drain expansion tank, renew air filter and test the controls of heating system.

OCTOBER

S	M	T	W	T	F	S
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2	3	4	5	6	7	8
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16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

Renew defective weather stripping. Shut off and drain outside water lines.

NOVEMBER

S	M	T	W	T	F	S
		1	2	3	4	5
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13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Are your tire chains ready to roll? Replace weak links and closing snaps.

DECEMBER

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
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To have a merry Christmas, test the tree lights, clean and oil train sets now.

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January, 1955 — Page

Lumberjacks Race Bugs in Frozen Forest.... 97
Amazing Machines That Simplify Flying.....102
World May Adopt New Calendar in 1961....110
Now They "Print" Metal Tubing.....114
How Soviet Warplanes Compare with Ours..116
New Treatment Cures Black Eyes Quickly....119
Fun's Henry Ford Is Still Inventing.....122
Ships That Prowl in Arctic Seas.....128
How You Become a Polar Bear.....134
Mysterious Boom in Mercury Mining.....139

AUTOMOTIVE NEWS

Imperial's Lines Delighted Wilbur Shaw....143
Annual Box Score of 1955 Cars.....148
Novel Twists Distinguish Foreign Cars.....150
All About Tubeless Tires.....151
Child's Car Hits 5 M.P.H.....154
Sports-Car Maker Tests New Ideas.....155
Cars Behind the Iron Curtain.....158
Gus Pursues the Little Green Men.....166

DO-IT-YOURSELF IDEAS

PSM Goes to a Coat-Hanger Party.....169
10 Uses for Doorknobs.....176
How to Align Your Headlights.....177
Frame a Mirror the Colonial Way.....180
Darkroom Dora's Useful Photo Tips.....182
Sure Cures for Ailing Shop Motors.....185
How to Service an Automatic Choke.....193
14 Different Ways to Drive Nails.....198
Twin Desks Take Less Space Than One.....202
You Can Clean Furnace Filters.....204
How to Make a Jig-Jet Puzzle.....207
Pre-Scored Tiles Are Easy to Fit.....210
What You Should Know About Abrasives....213
Cutting Distortion from Cabinet Woods.....221
Five Easy Ways to Add Storage Space.....226
You Can Build a Shop Heater.....230
Extensions Add to Radial-Saw Capacity.....240

(More features and departments are listed on page 4)

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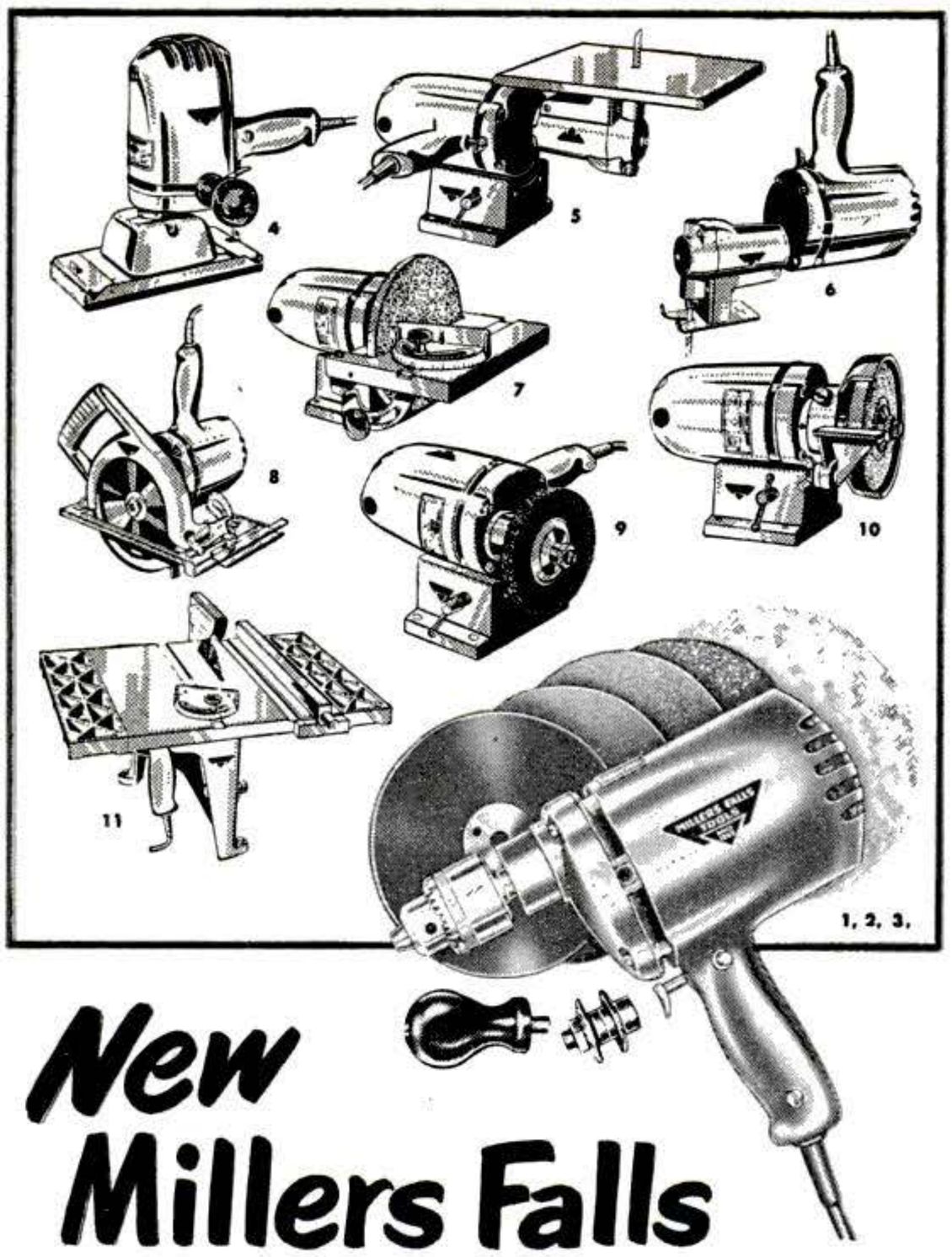

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News and Pictures

Clip on Nose Aids Escape from Sub.....100
Radio Switches Transit Trains.....100
Beehive House Creates a Buzz.....101
Space Cadet's Playhouse Is Rocket Ship..106
Science Probes the Camel.....106
Spinning Antenna Loops Tune in Static..107
Popcorn Popped in the Package.....107
Fliers Turn Cooks on Long Patrols.....108
British Planes Are Well Hinged.....108
Small Jet Unit on Wing Stops Spin.....109
Cereal Carton Plays a Tune.....115
You Can Eat This Greeting Card.....121
Plastic Makes Ball-Proof Pane.....121
Machines from Europe Do Hard Jobs....126
All's Quiet in Huge "Echoless" Room....127
Rifle Kills Tanks at Twice the Range.....127
Roof Markers Warn Off Enemy Planes..136
Plastic Bubbles Light Warehouse.....136
Bobsled Makes Dry-Run Test.....142
Machine Makes Board from Waste.....142
Robot Snow Remover Can Talk, Too!....160
Giant Machines Build Today's Planes....161
Transformers Live in Luxury Homes.....164

Mechanics and Homebuilding

Plugging Holes in Soft Metals.....181
Improving a Low-Cost Mike.....181
Cultivator Plow Clears Snow.....184
Ice-Skate Clogs Easily Made.....184
Trailer Hitch for Walking Tractor.....201
Rubber Tubing Sheathes Knife.....201
Handy Wall File in a Jiffy.....220
Disk Makes Candle Warmer Safe.....220
Motor Rides the Rails on This Mount....225
Plane Sharpens Shop Pencils.....225
Kids Helped Build This Playhouse.....228
Magnets Make Soldering Jig.....228
Pencil Is Kept Handy in Saw.....229
Flatiron Serves as Shop Anvil.....229
Drilling a Jug for a Lamp.....232
Hanger Keeps Work Book Open.....232
Sockets Make Wheel Bearings.....232
Nut Guides Tap at Right Angle.....240

Departments

Letters 12
Last-Minute News and Notes..... 94
New Ideas from the Inventors.....137
I'd Like to See Them Make.....165
New Tools.....191
New for the Handy Man.....197
Keeping the Home Shipshape.....205
New for Your Car.....212
Wordless Workshop.....218
New Shop Ideas.....236
Craftsmen at Work.....241
Hints from the Model Garage.....242

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How I foxed the Navy

by Arthur Godfrey

The Navy almost scuttled me. I shudder to think of it. My crazy career could have ended right there.

To be scuttled by the Navy you've either got to do something wrong or neglect to do something right. They've got you both ways. For my part, I neglected to finish high school.

Ordinarily, a man can get along without a high school diploma. Plenty of men have. But not in the Navy. At least not in the U. S. Navy Materiel School at Bellevue, D. C., back in 1929. In those days a bluejacket had to have a mind like Einstein's. And I didn't.

"Godfrey," said the lieutenant a few days after I'd checked in, "either you learn mathematics and learn it *fast* or out you go. I'll give you six weeks." This, I figured, was it. For a guy who had to take off his shoes to count above ten, it was an impossible assignment.

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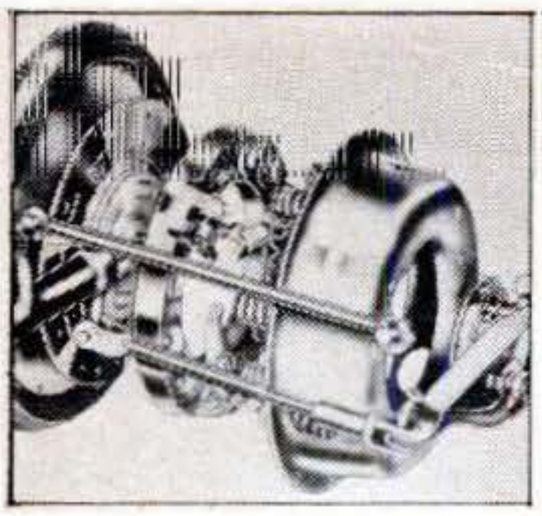

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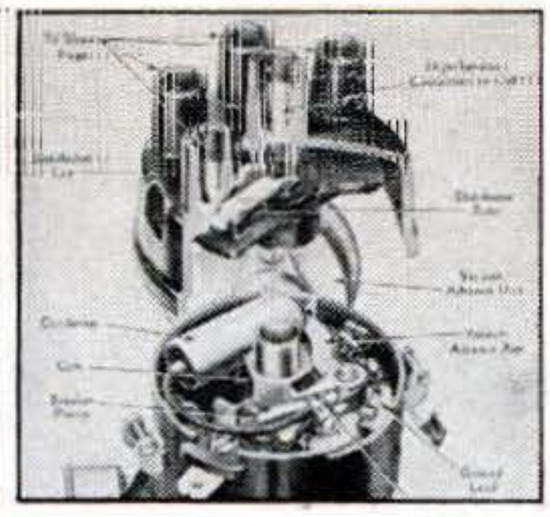

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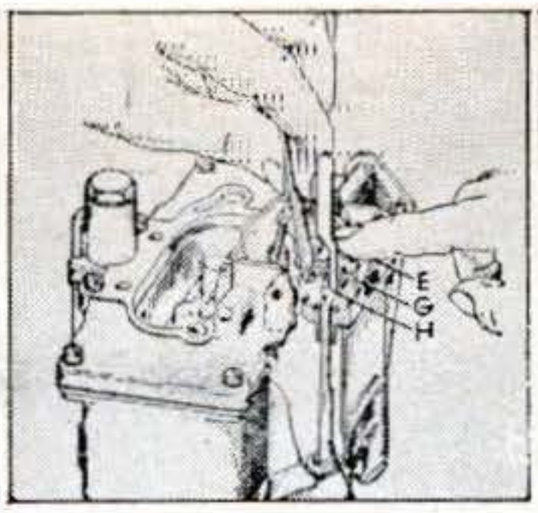

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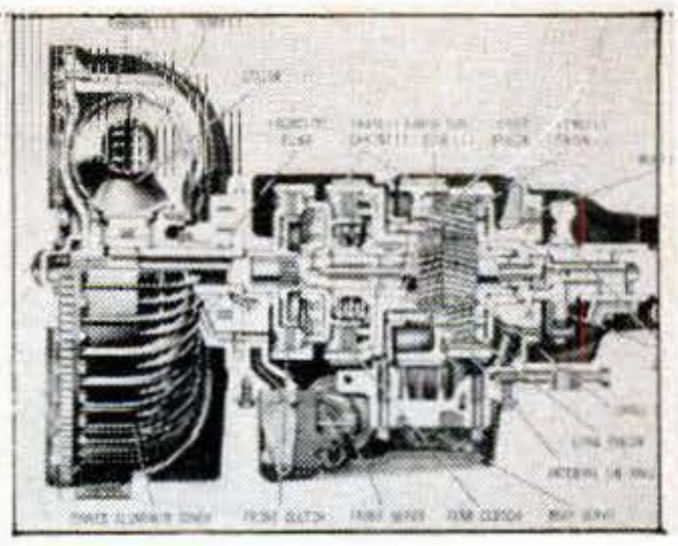

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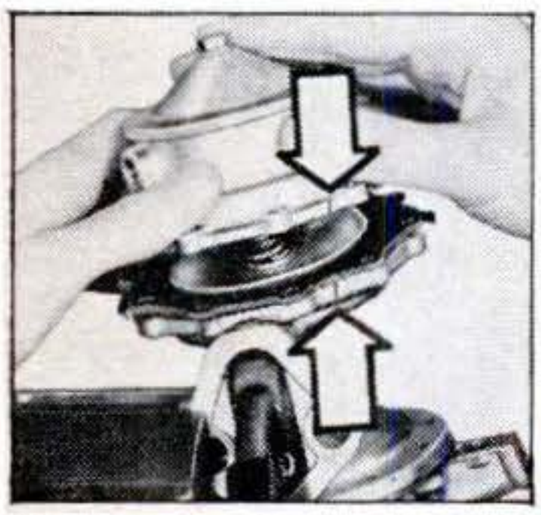

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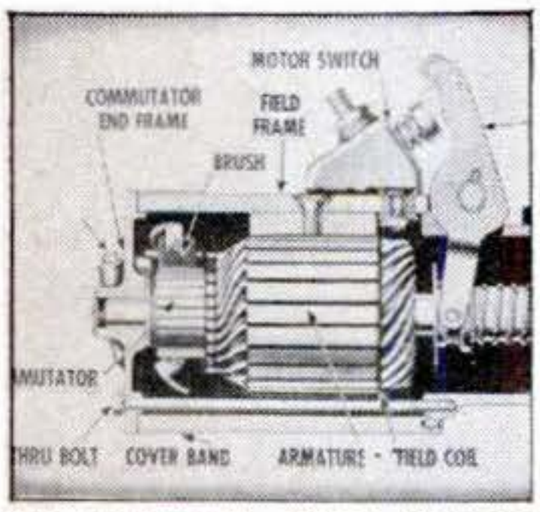

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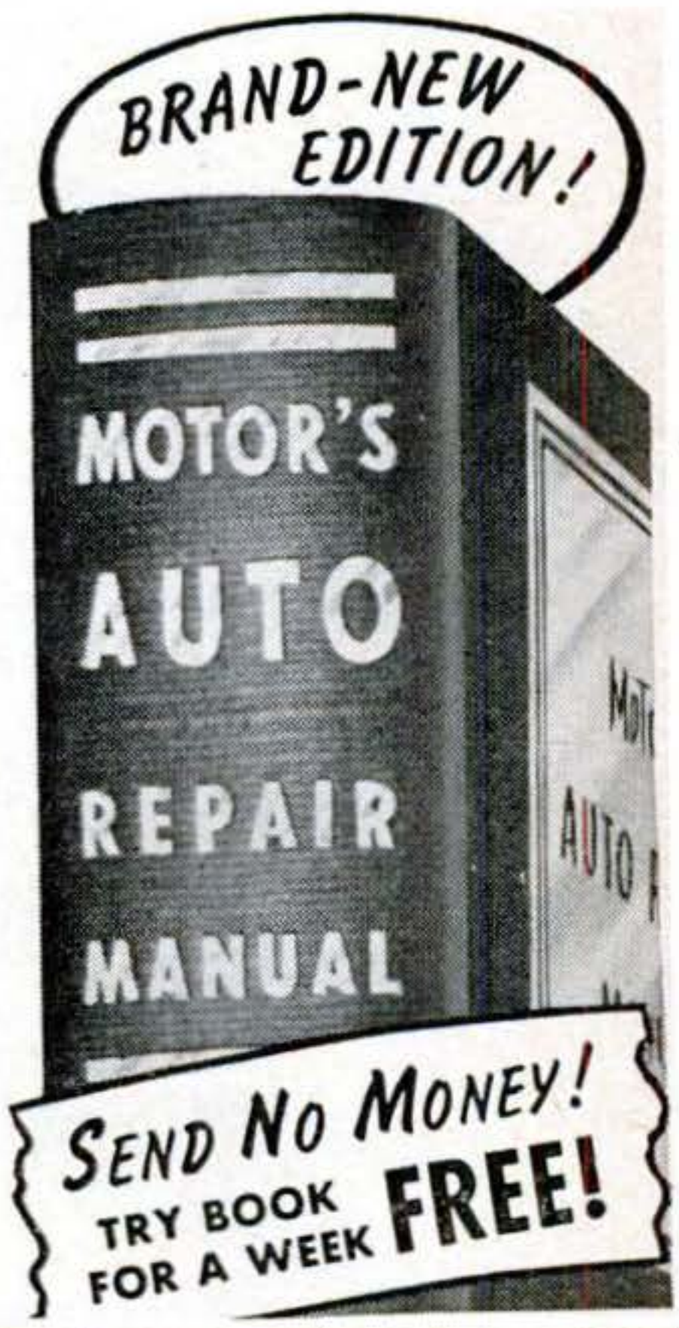

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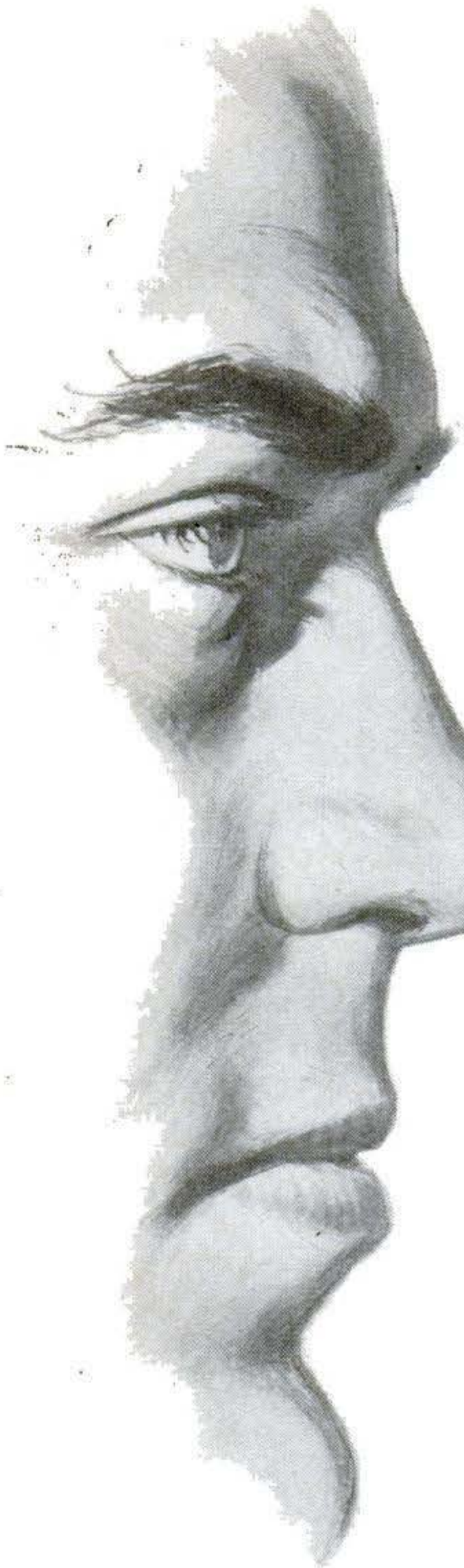

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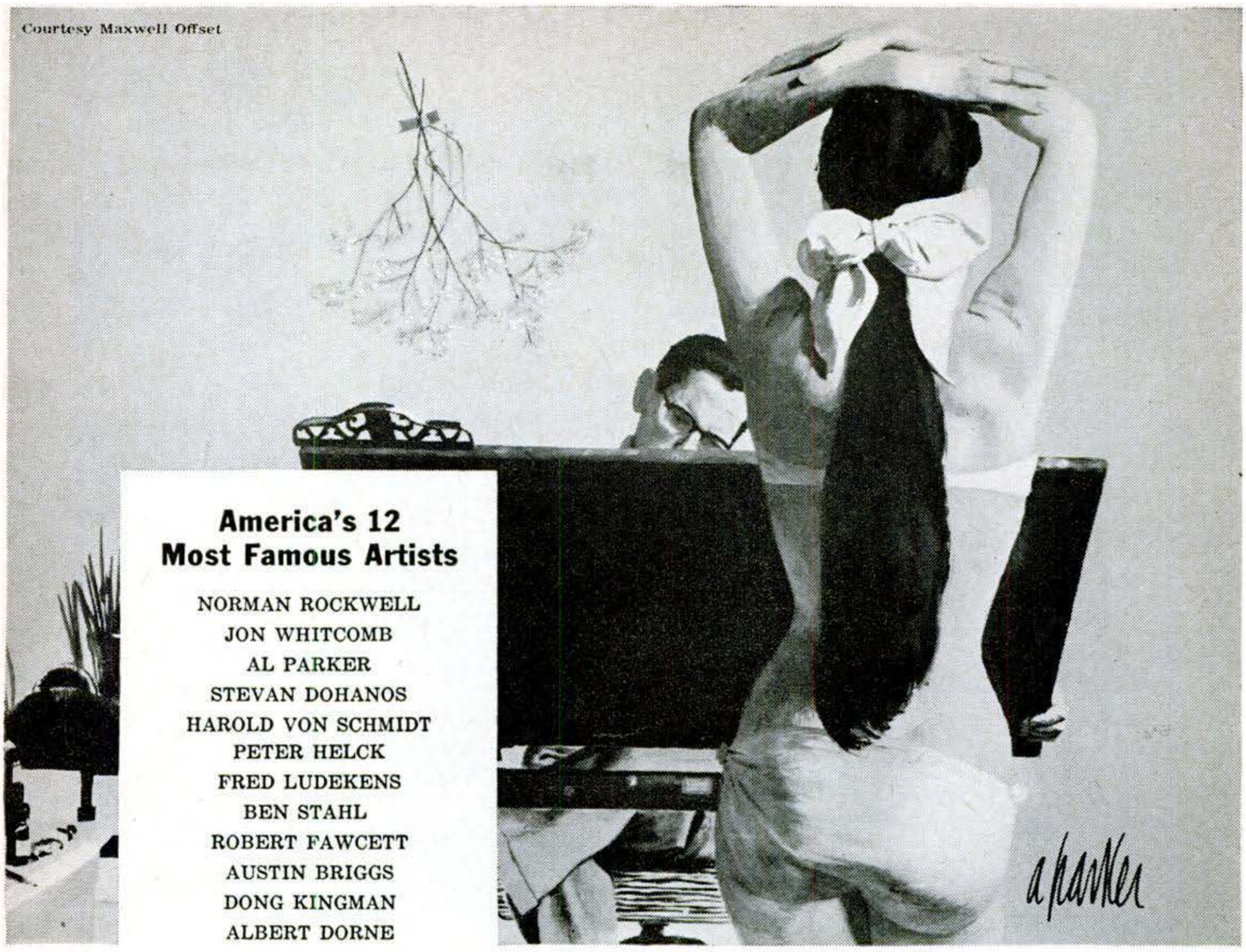

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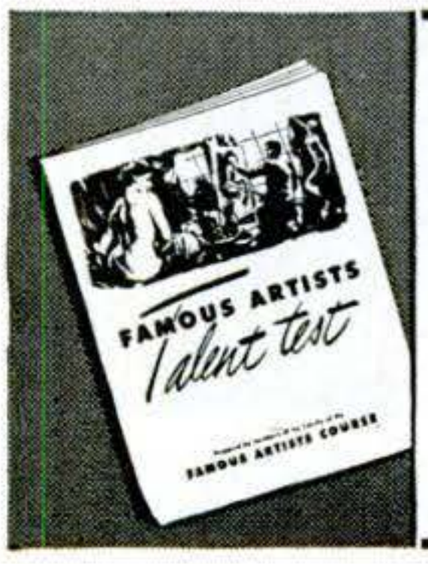

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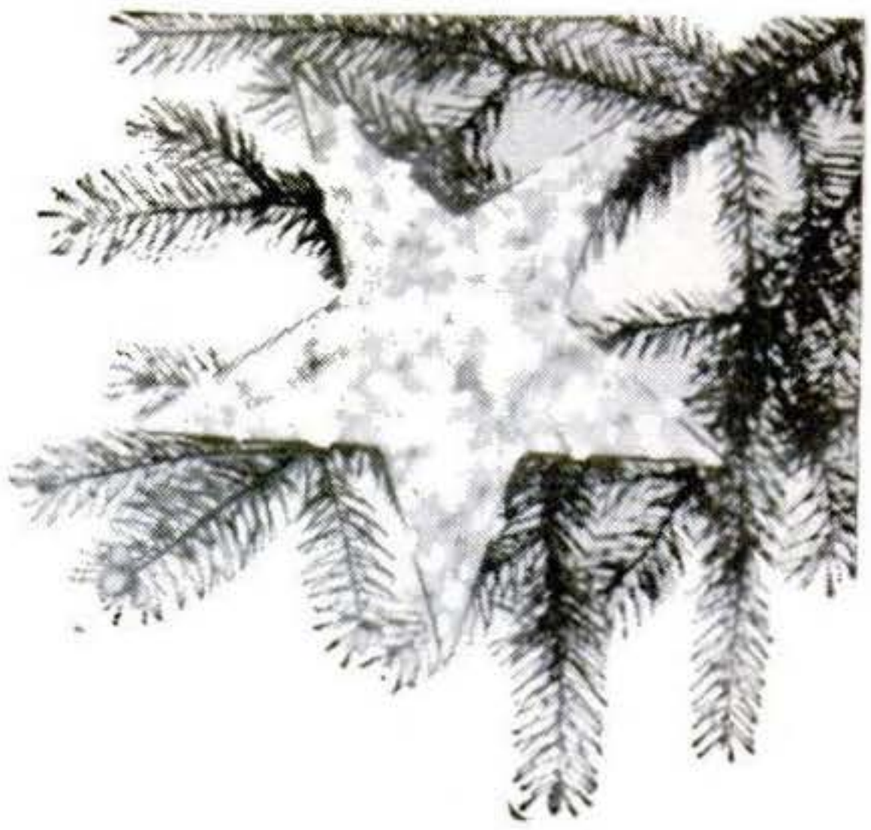
the boy and the Star



He is old enough now to know that the ornament on the tree is more than a star . . . to understand the deeper meaning of Christmastime.

Now he knows that it is love that has been shining on the tree year after year, the love that has wrapped and held him . . . that has given him food and warmth and laughter and the promise of joy to come.

Life's great reward is the privilege of giving security to those we love.

And, think: When you make *your* home secure you are also helping make America secure. For the strength of America grows as the number of its secure homes increases.

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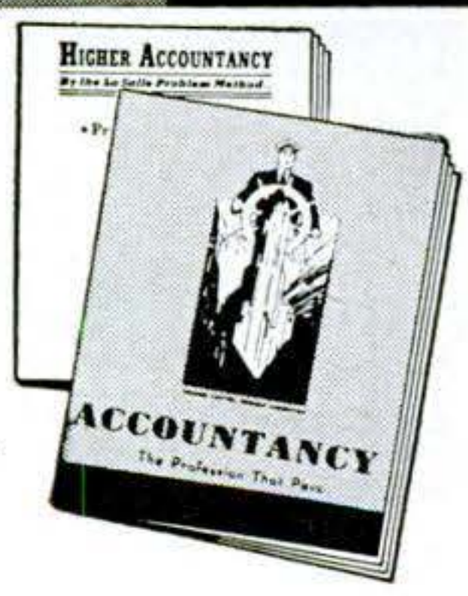

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Letters

Europe in You-Name-It

In your November issue I turned immediately to "Europe in Two Hours" and I was not disappointed. All it will take, I found, is somewhat improved designs, better engines, better fuel, and some way of cooling off that surface friction—what a nuisance!—that tends to set in at around 4,000-8,000 m.p.h.

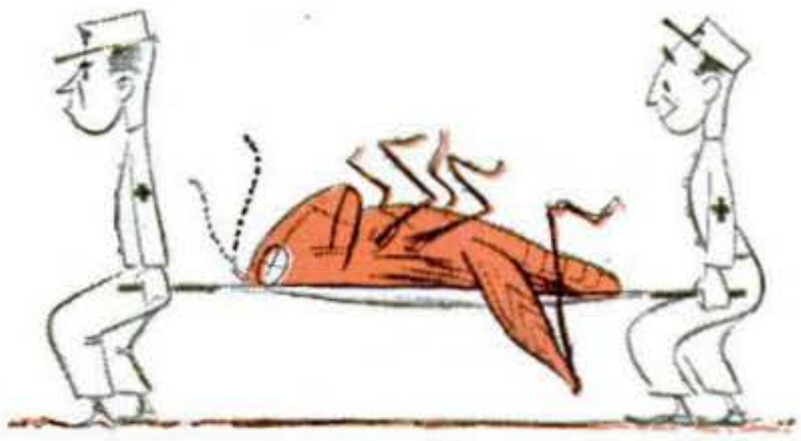
At any rate, Balchen has given me a lot of ideas. Wouldn't you like me to write a piece for you, "Europe in Fifty Minutes"? All I need is some better stuff than Balchen's better stuff and a few ideas of my own that I do not wish to divulge at this stage.

But don't blame me if those wretched old airport buses are still on the job. My subject is strictly the long-distance stuff.

CHARLES W. MORTON, Boston

Grasshopper Trouble

I once saw a grasshopper short a spark plug, but, unlike the one in the Gus Wilson story [July '54, p. 128], he didn't survive. Somehow he got himself in between the spark-plug terminal and the cylinder head on a four-horsepower gasoline engine my father was using to drive the sickle and canvases on a harvester. I don't believe the



grasshopper knew what hit him, but the motor and the machinery that it drove surely stopped. R. F. MIRICK, Spokane

How to Cart Twins

Being unable to find a twin stroller compact enough to fit our car, my wife devised

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the unit shown in the attached photograph.

It was made from an old baby carriage. The flexible carriage was stripped from the frame. Then the two cross members, made from part of the sunshade frame, were added by drilling out old rivets and replacing them with bolts. Finally, the individual sections were made like a portable baby seat for an automobile.

The sections are a bit large for very young babies, but pillows remedy that problem until the children are big enough to support themselves.

CHARLES W. REYNOLDS, Pasadena, Tex.

"Unwanted" Invention Defended

I would like to suggest to Ira C. Bollart of St. Louis that there is plenty wrong with "the old, reliable, nonsticking hand signal" (Oct. '54, p. 16) and nothing at all wrong with the electric turn signal. I, too, have followed for miles an auto whose driver was making a continuous right-hand turn signal—but he was doing it with his hand, not electrically. He was merely one of those birds whom I term a "roof-holder-upper."

RUSSELL B. HOPKINS, Cincinnati

Mr. Bollart seems never to have noticed motorists (both men and women) who stick a hand out of the window to flick ashes from a cigarette or cigar. The driver behind does not know whether they are going to turn or not.

W. B. SPEARS, Ecorse, Mich.

I think electric turn signals are one of the more useful gadgets on modern automobiles. I have no desire to grind my left window down in zero weather to give a signal.

DAVID W. SULLIVAN, Cleveland

When you have to signal with the hand, it means that you are driving with only one hand. Furthermore, on a rainy and dark night, how would you see a hand signal as well as a red light?

C. M. HUNTLEY, Seattle

Especially at night, a hand signal cannot be seen against black-top roads.

Now, I could agree with Ira Bollart if he had only said that the invention that should

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never have been invented is the highly dangerous black-top road.

A. L. SELIGMAN, Vancouver, Can.

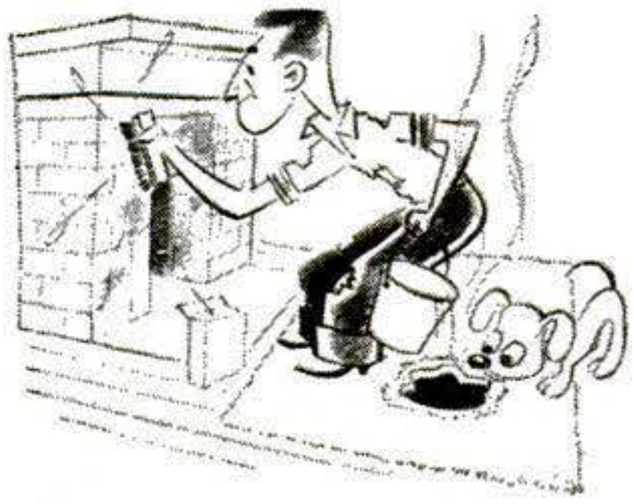
Regardless of how one feels about turn signals, I wish the unnecessarily noisy automobile horn had never been invented.

ANTHONY GALIANO, Brooklyn

Who else would like to abolish black-top roads or nerve-wracking horns? If not, what particular invention could you do without?

Caustic Soda Is Hot Stuff

I'm surprised that the short item about cleaning smoke stains from fireplaces (Oct. '54, p. 237) did not include warnings about the caustic-soda solution specified. A one-and-a-half-pound-per-gallon mixture is



strong stuff. It should never come in contact with bare hands, and a splash in the face could endanger the eyes. It's even dangerous to add this chemical to hot water; if done rapidly the heat of solution may cause violent spattering.

JAMES DONEGAN, Wheeling, W. Va.

True. Caustic soda is a type of lye. Mixing should be done slowly, and the user should wear rubber gloves and goggles. The solution should be kept off clothing, rugs, shoes and linoleum, as well as painted woodwork.

Speaks Up for 78-R.P.M. Records

The article on "How to Pick Out a Hi-Fi System" in your October issue [p. 175] was interesting and informative, but it erroneously gave the impression that 78-r.p.m. records are going out of date. Actually, hi-fi recording companies consider the old 78 r.p.m. the best speed for hi-fi reproduction.

W. F. SCHANEN JR., Port Washington, Wis.

The author was merely expressing a personal preference for the longer-playing records. He says they give him more music for his money. Besides, the 78-r.p.m. records he referred to were the old standards, which certainly are out of date, and not the 78-

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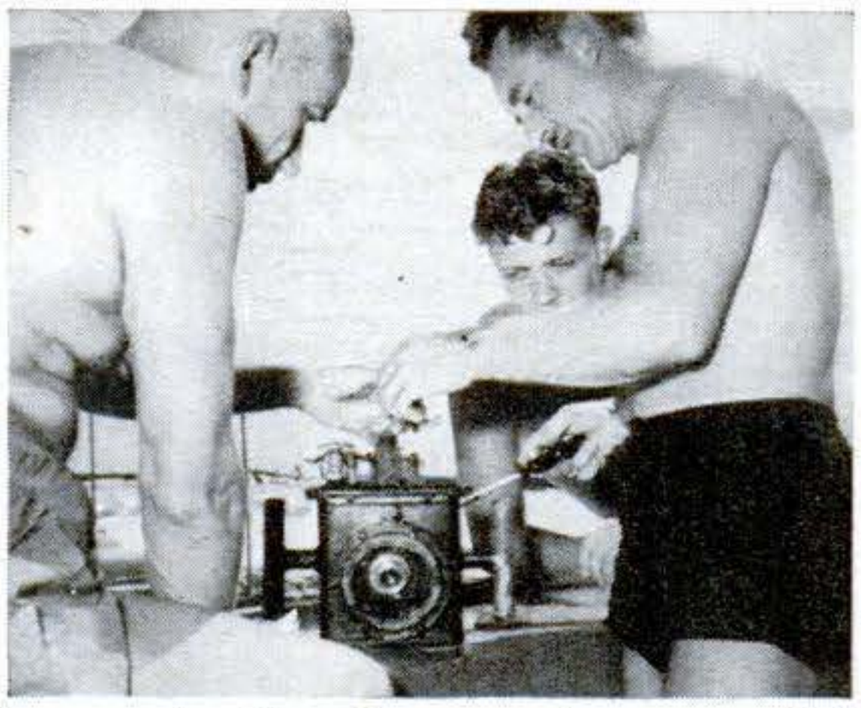
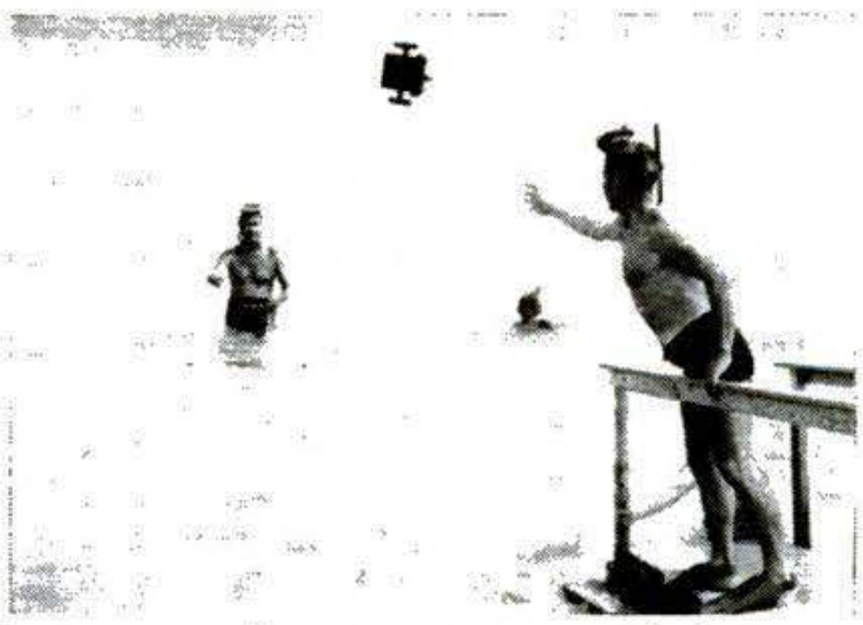
r.p.m. microgrooves, to which Mr. Schanen undoubtedly refers.

Picture Story

When your chief photographer, Bill Morris, was down here on vacation last fall, he helped me conduct an interesting scientific test of a new underwater camera case I had devised. Here's a documented report on the result:



Camera inside, the case is screwed tight.



Camera and case are tossed into water.

Retrieved by diver, case is opened for inspection.

Key West, Florida October 18, 1954 No. 59 S
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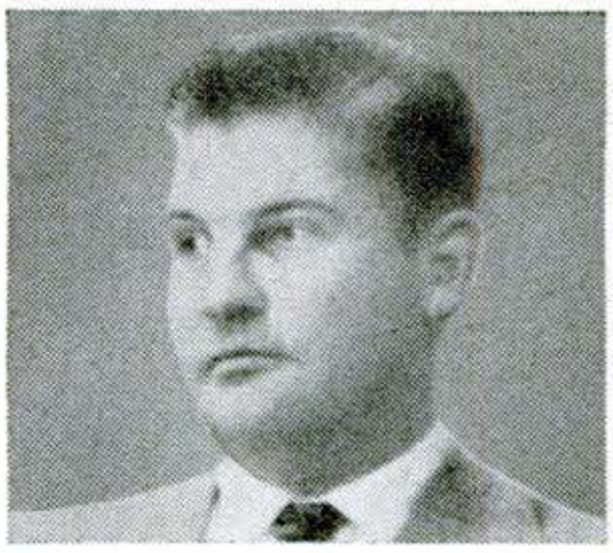

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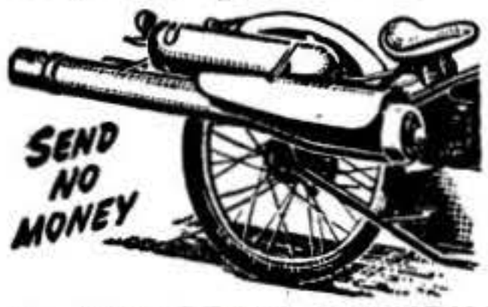

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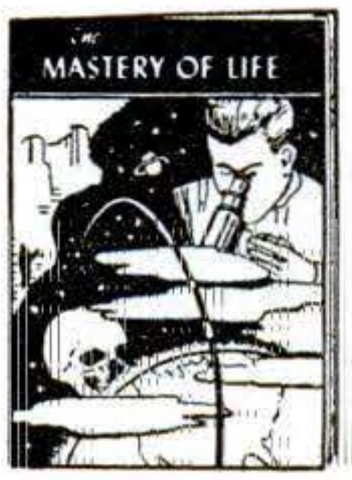

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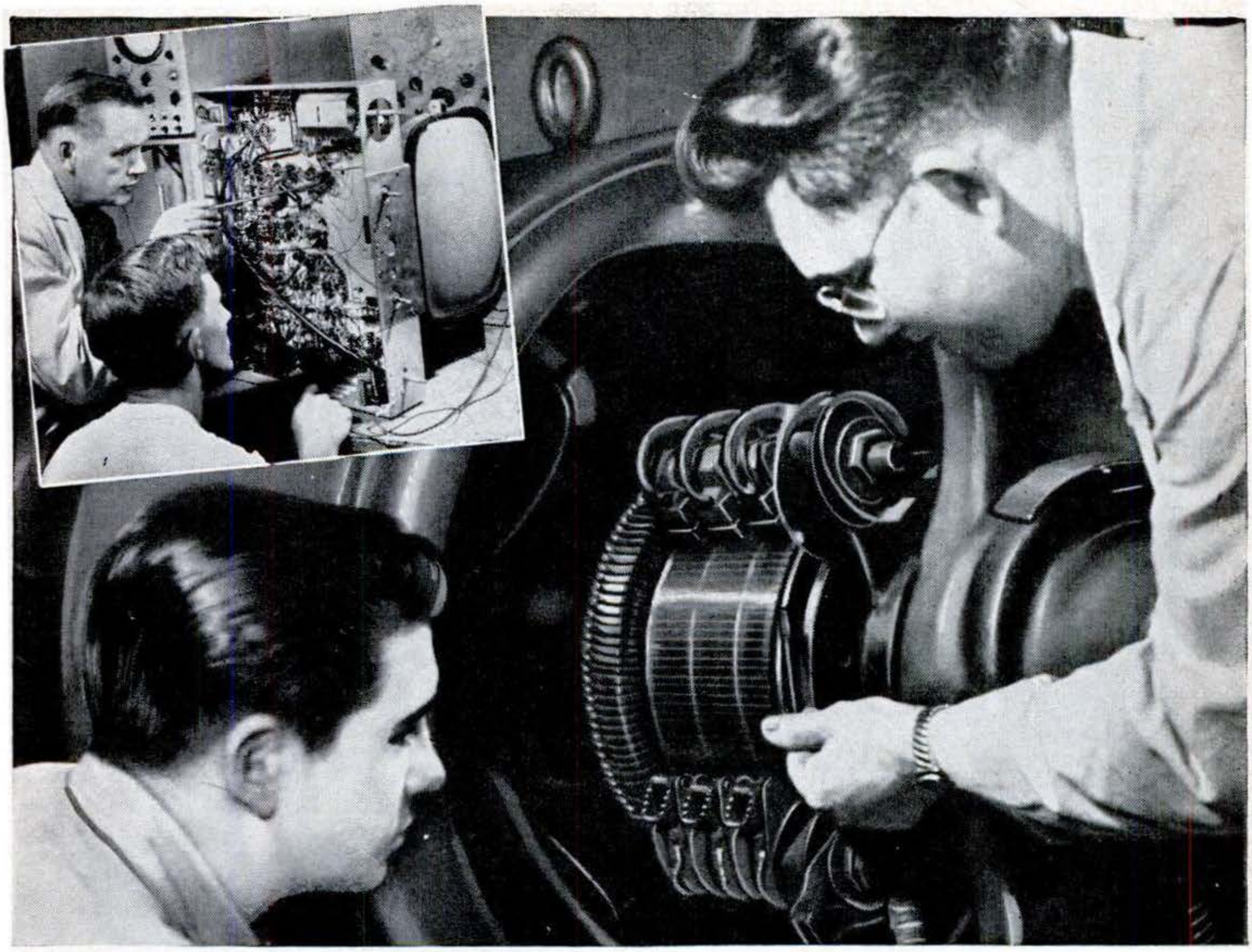

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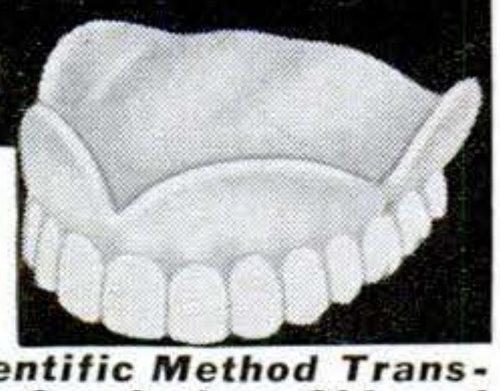

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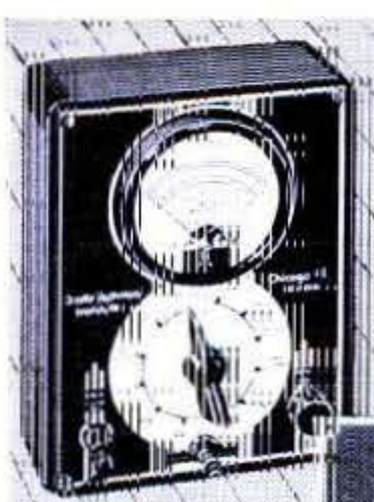

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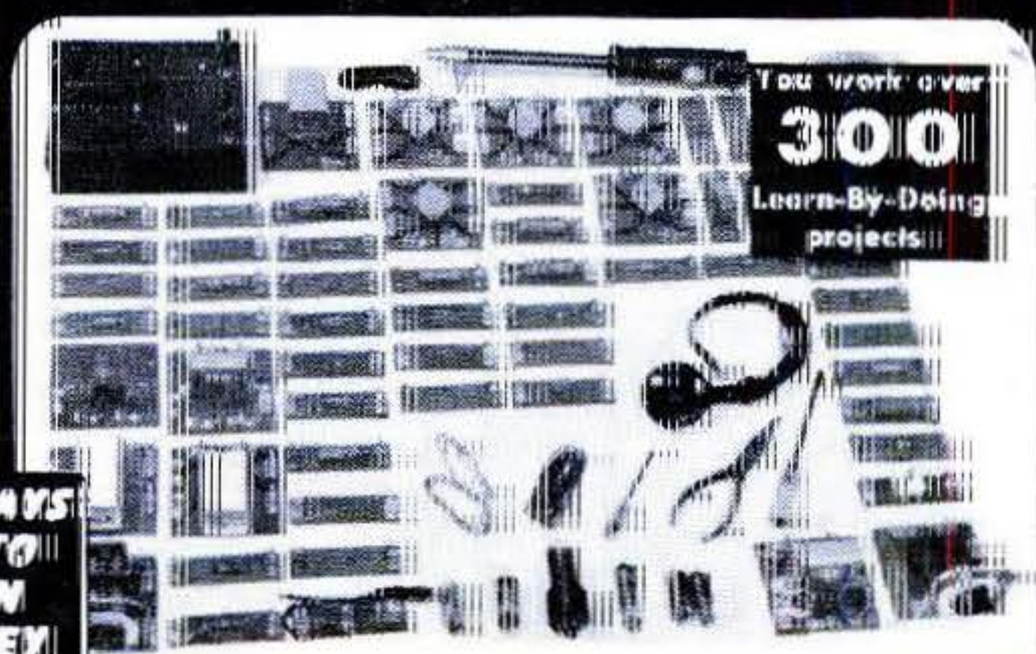

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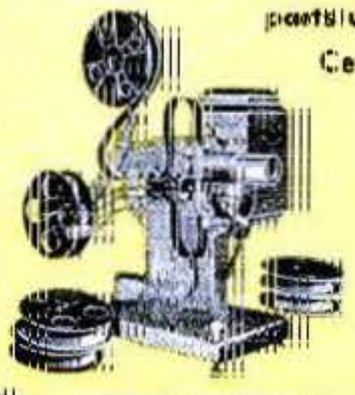

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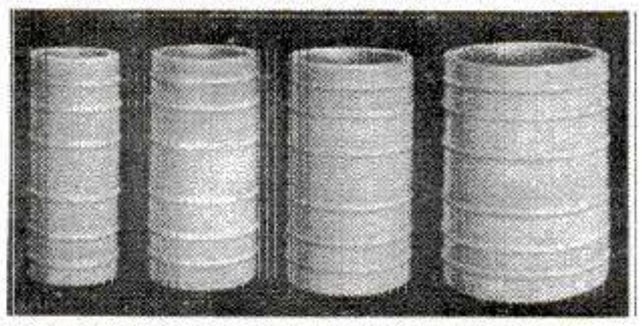

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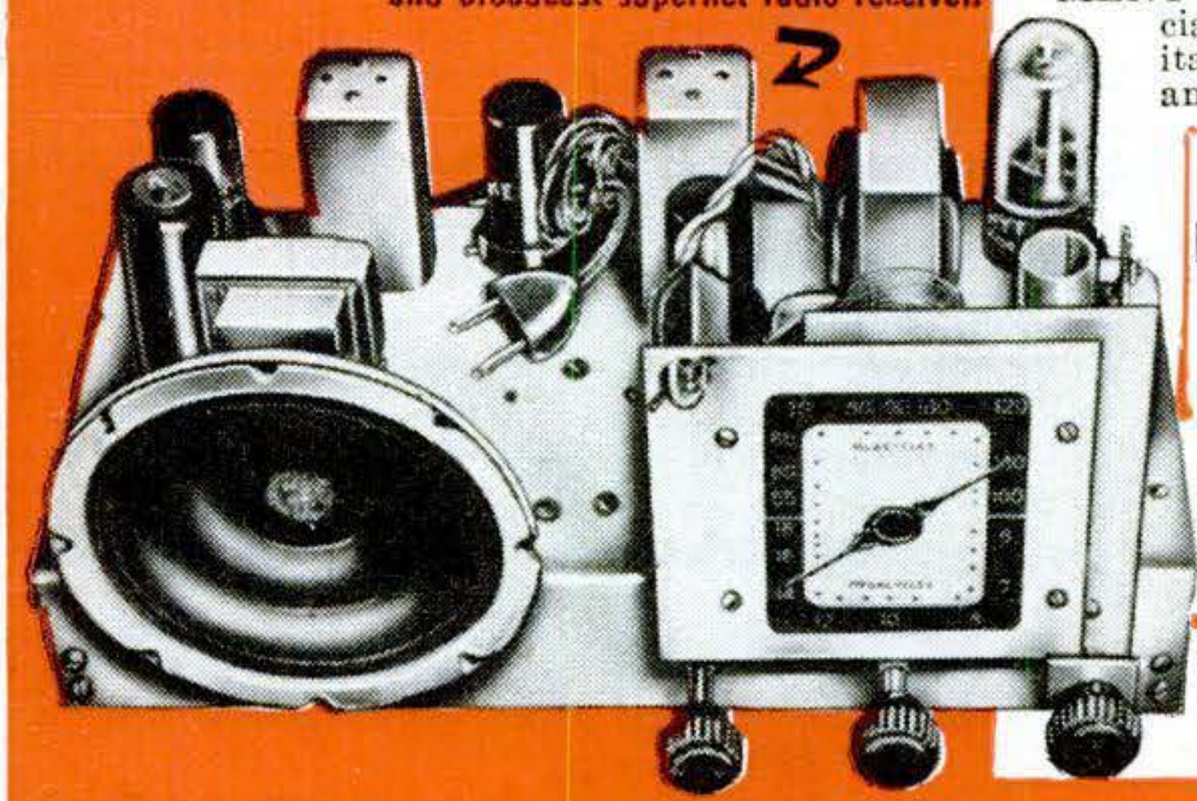

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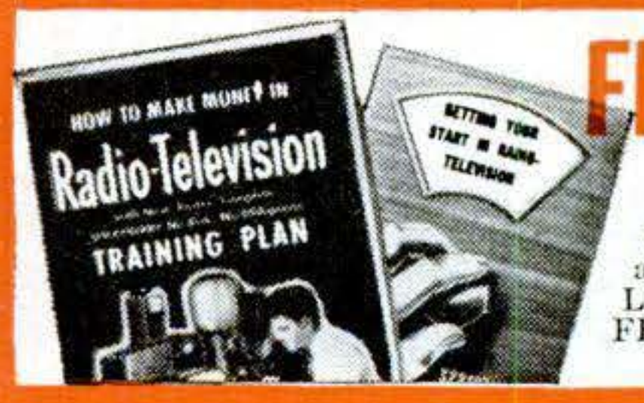

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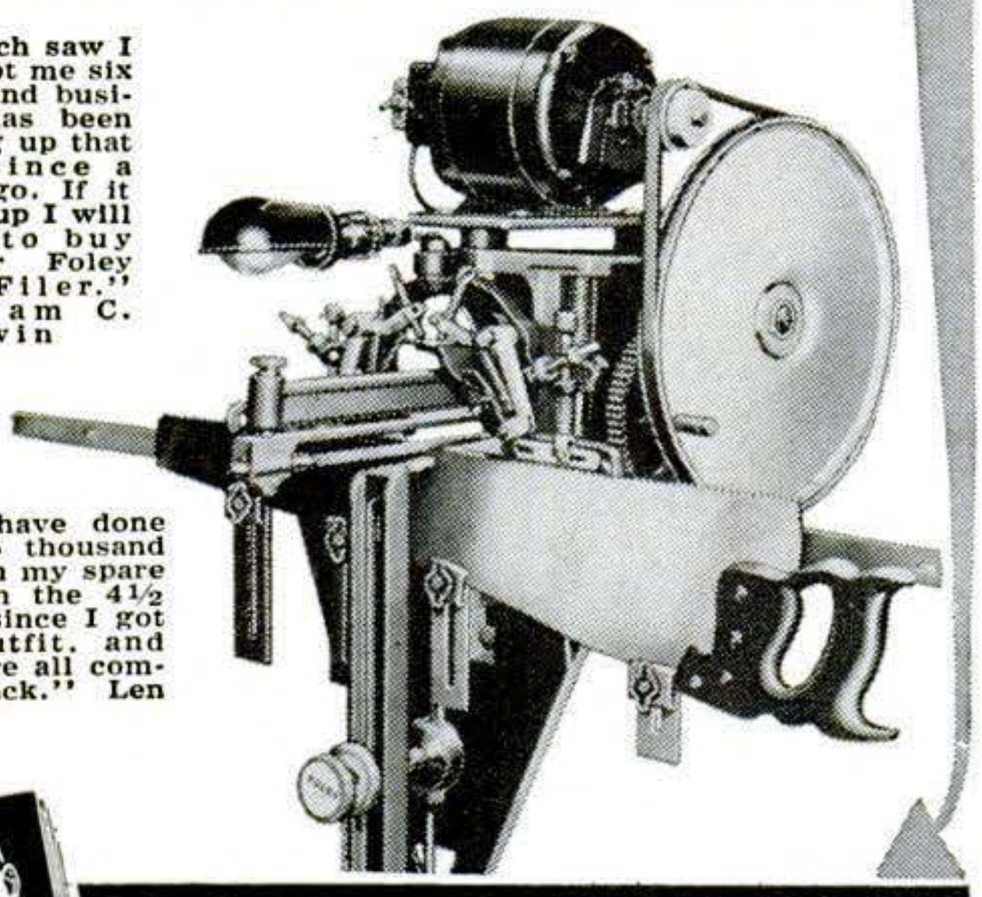

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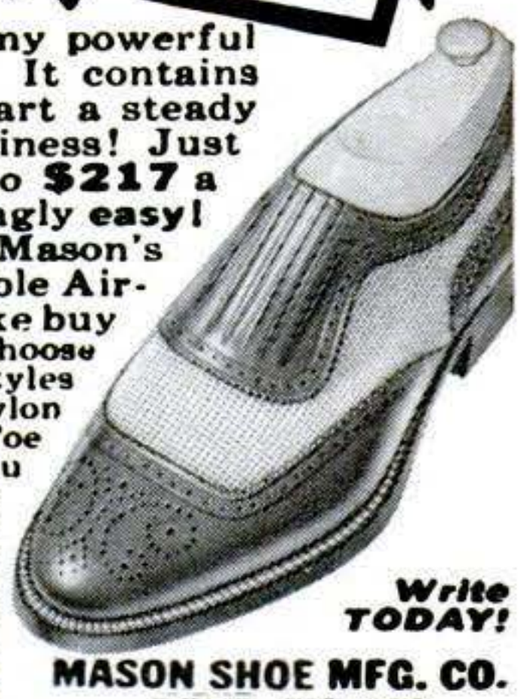

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700x16	6.35	760x15	5.95	750x15	10.95	900x20	19.95
750x16 *6*	8.45	800x15	6.35	30x5	11.25	1000x20	20.45
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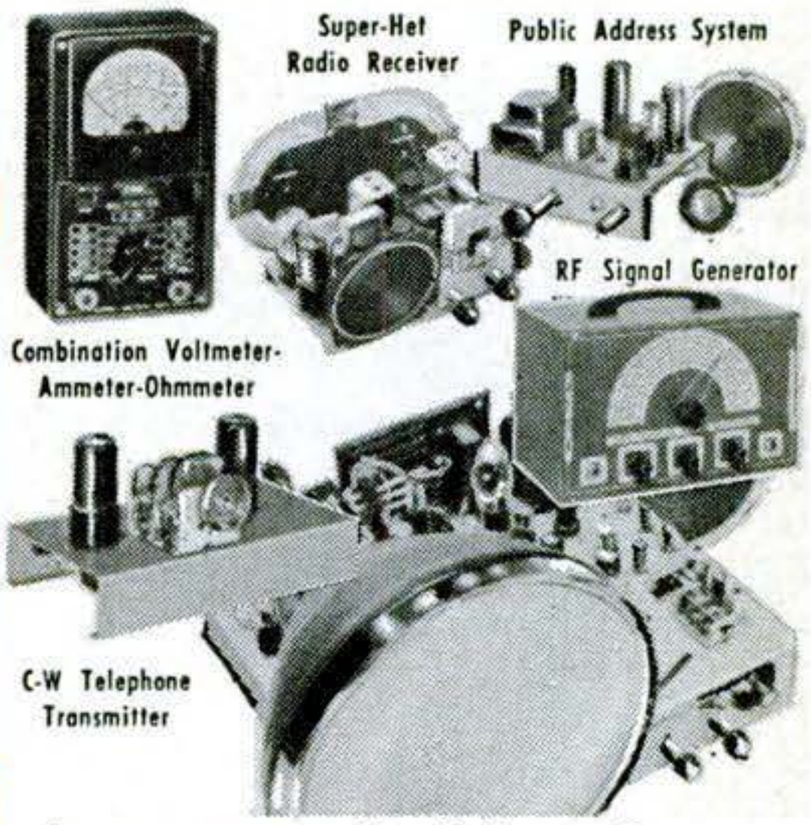

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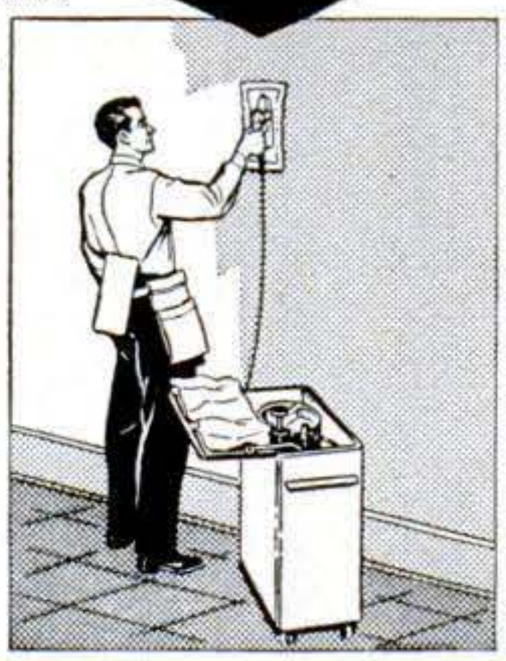

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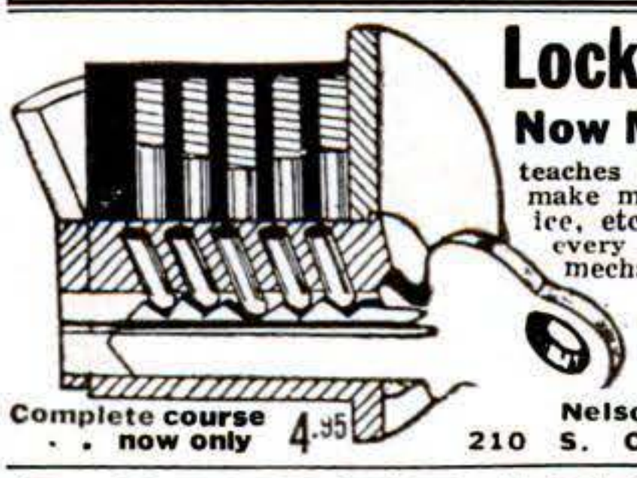

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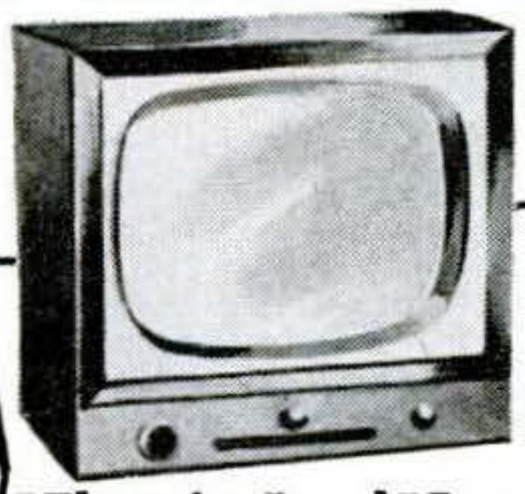

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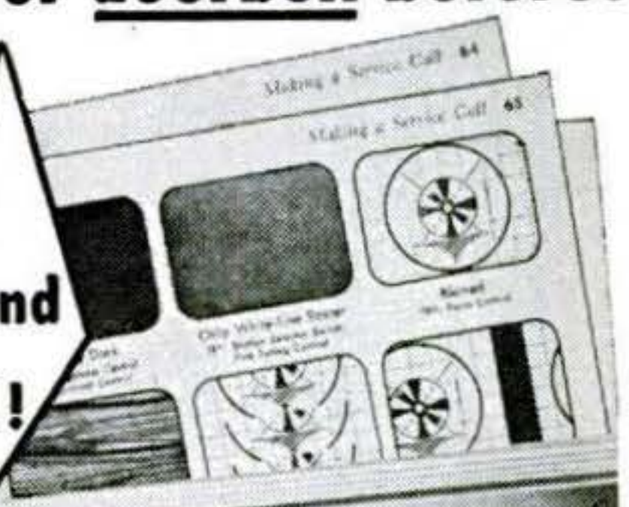

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WHY hasn't somebody done this BEFORE? That's what you'll exclaim the minute you start browsing through this amazing new one-volume instruction manual in TV and radio repair.

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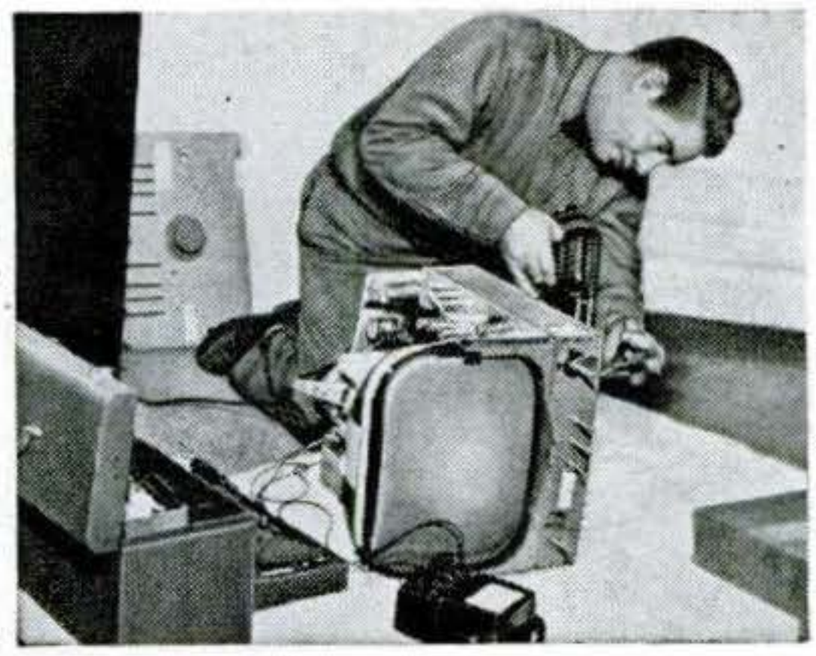
You get no complicated formulas, algebra, laboratory experiments. Instead you deal *only* with the parts that go wrong in sets—how to recognize the trouble—and what to do about it. "Easy as A-B-C" directions and 700 clear photos, diagrams, and drawings show you exactly WHAT and HOW to fix, step-by-step.



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The author is Associate Editor of *Electronics* Magazine. He spent FOUR years making this one-volume manual practical and easy-to-understand—even for an "unhandy" beginner.

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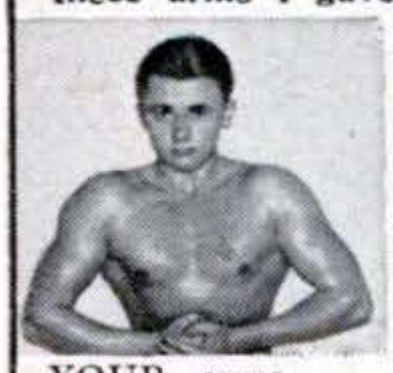

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. . . and mould them into a powerful bridge of strength! See what I did for Adnan Zabadeh

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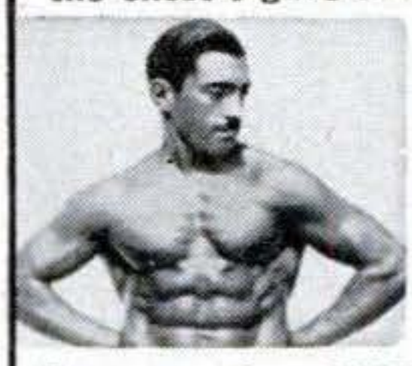
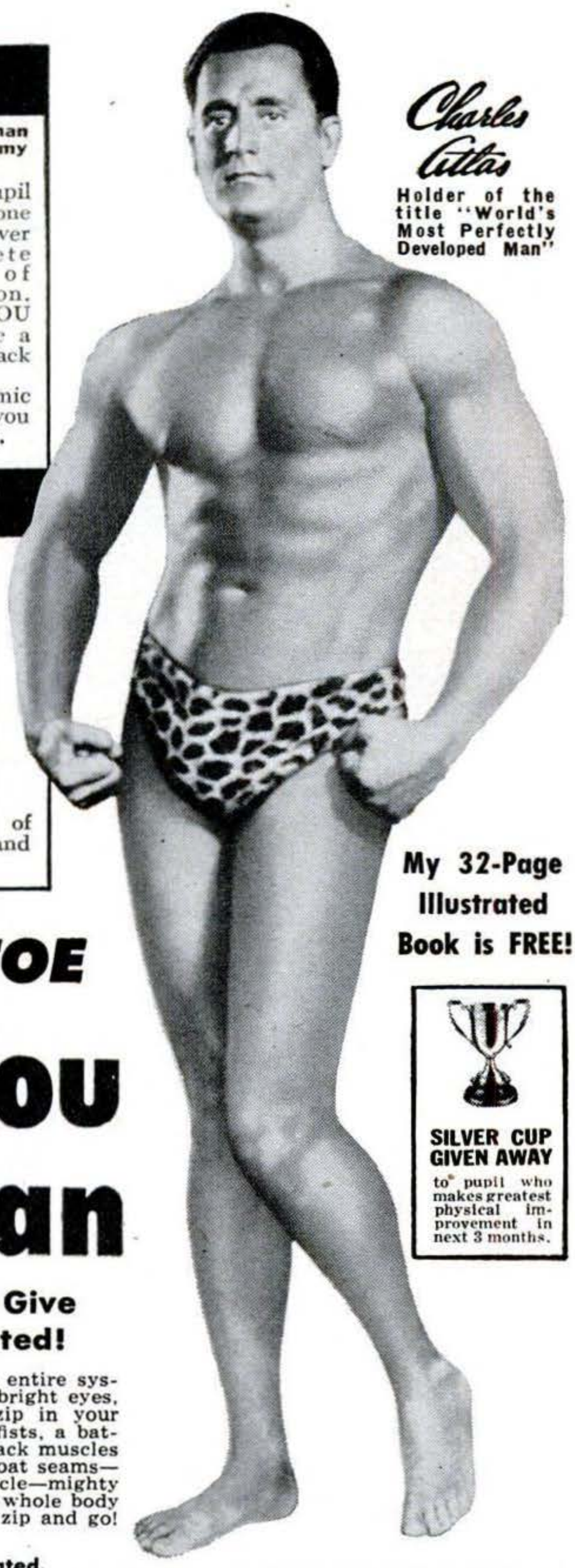
I Take Your CHEST

. . . and build it into deep muscled proportions! Here's the chest I gave Joseph Seldin



Joe Seldin's marvelous development is like a Greek god's—especially his chest. Let me give YOU the kind of chest that shouts "Power" and red-blooded "Health!"



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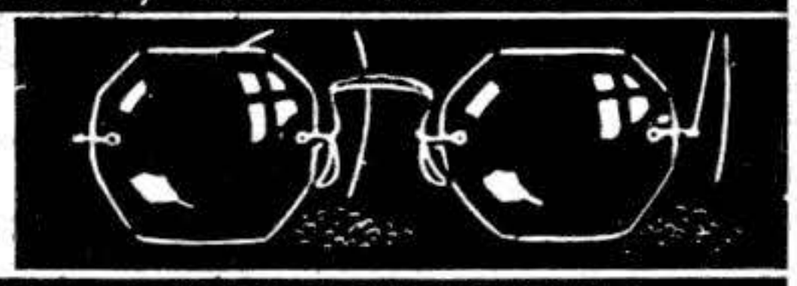

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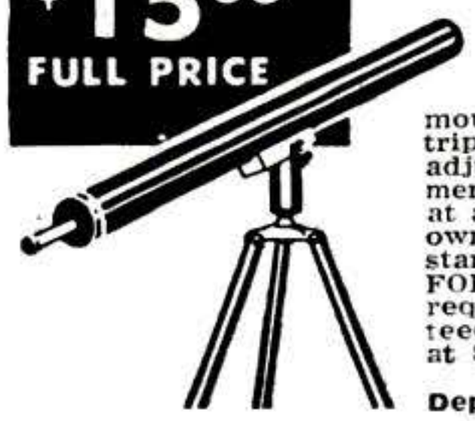

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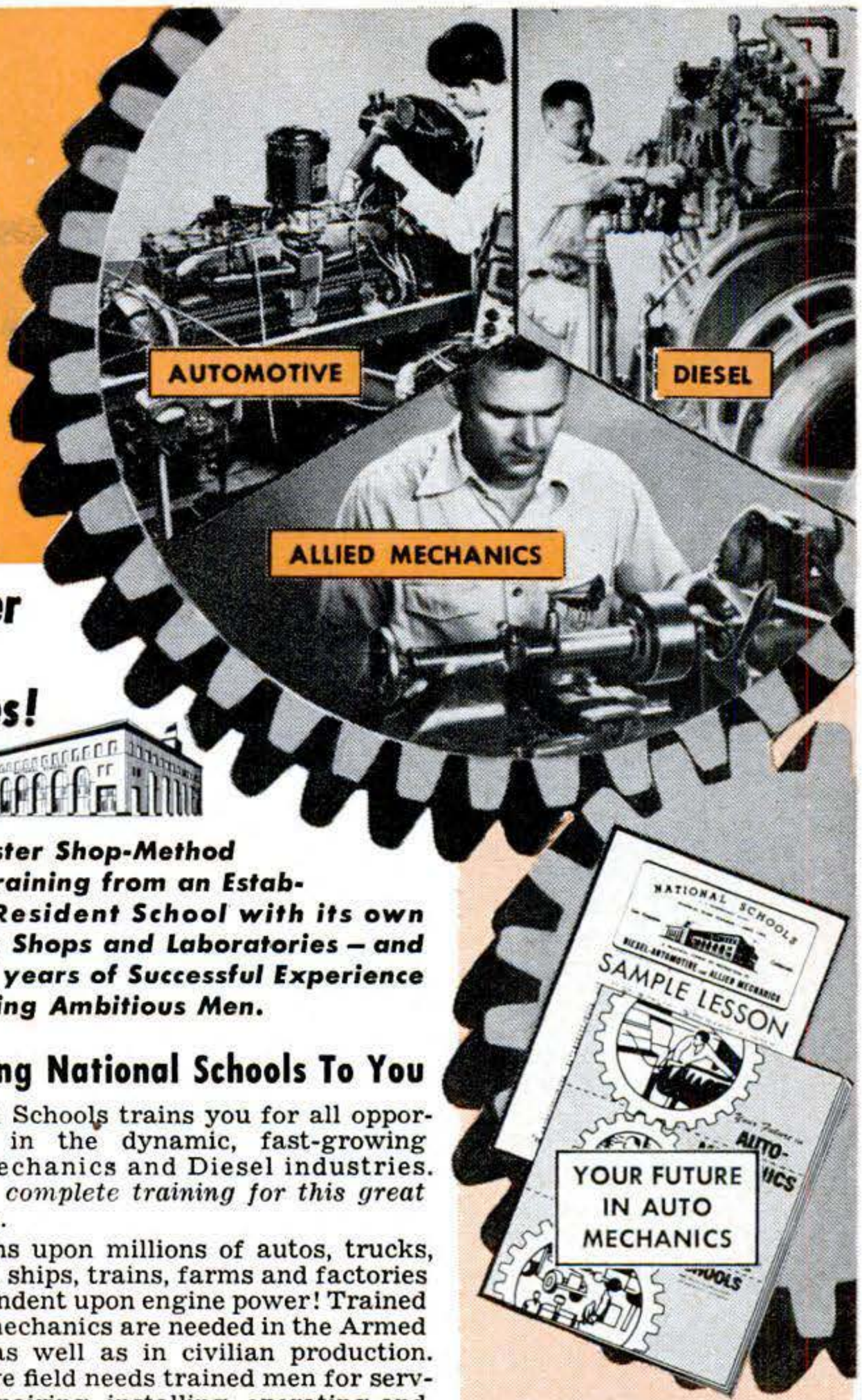

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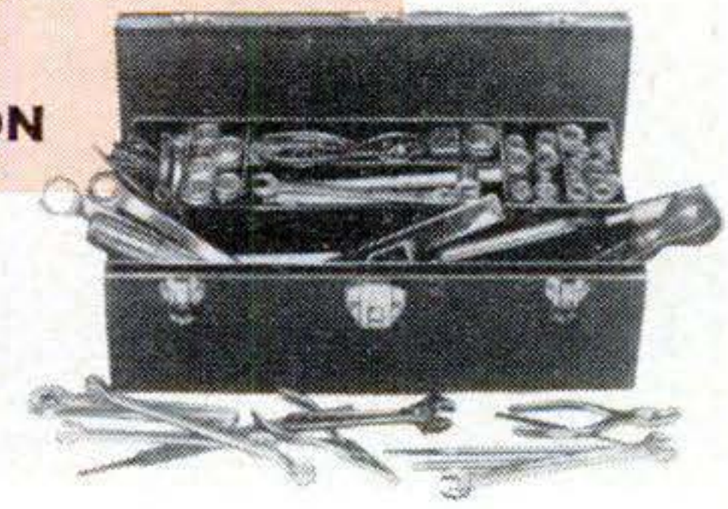

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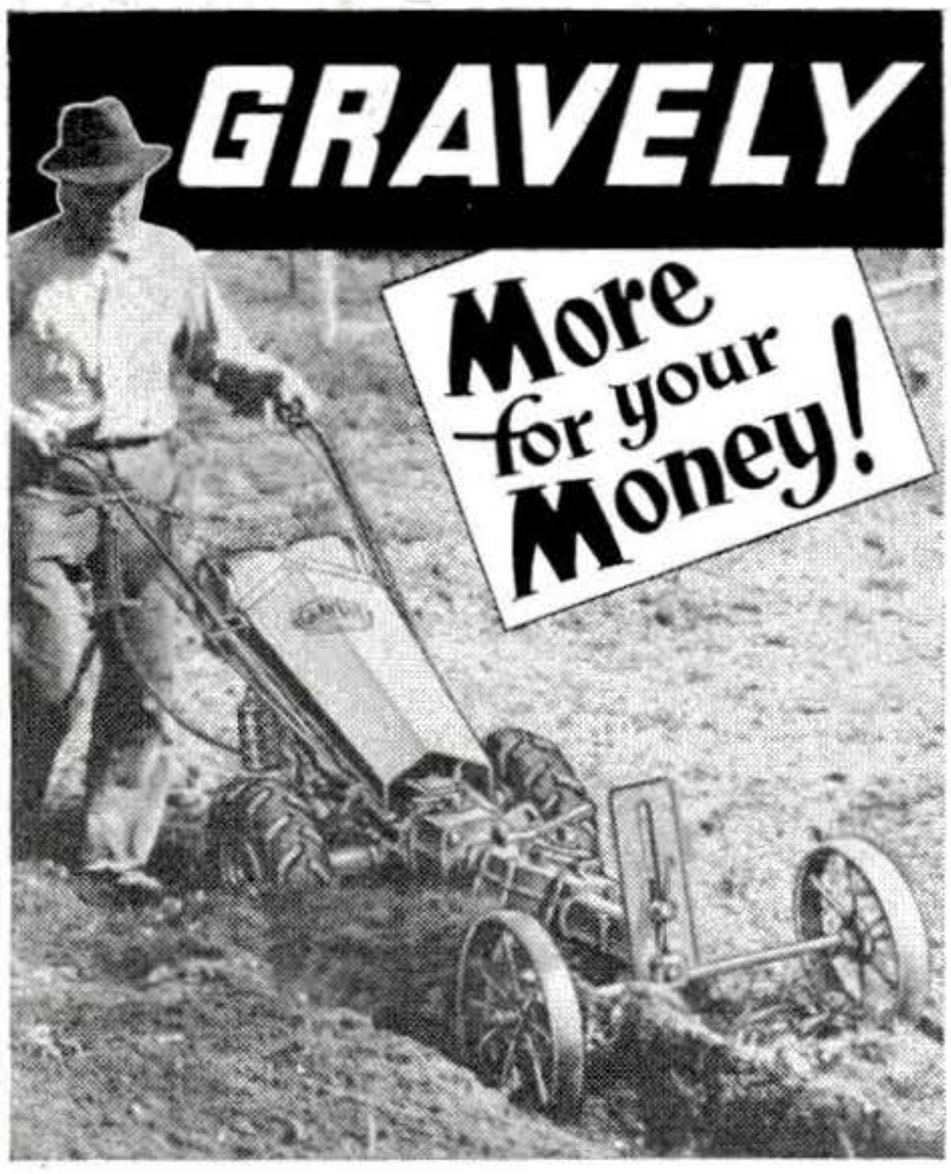

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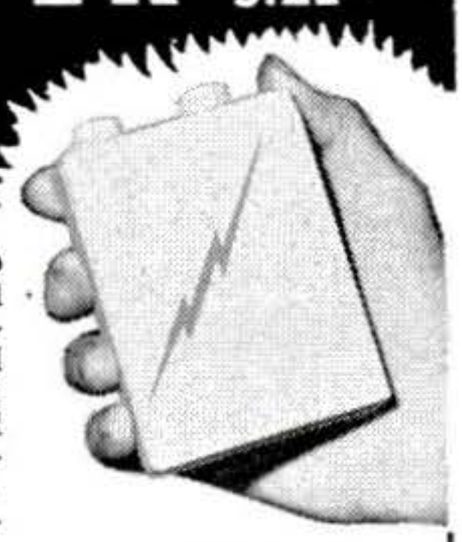

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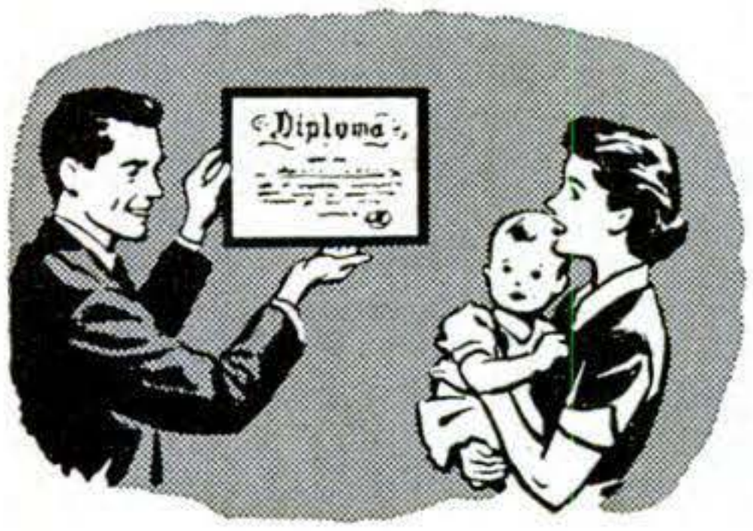

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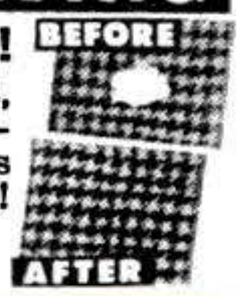

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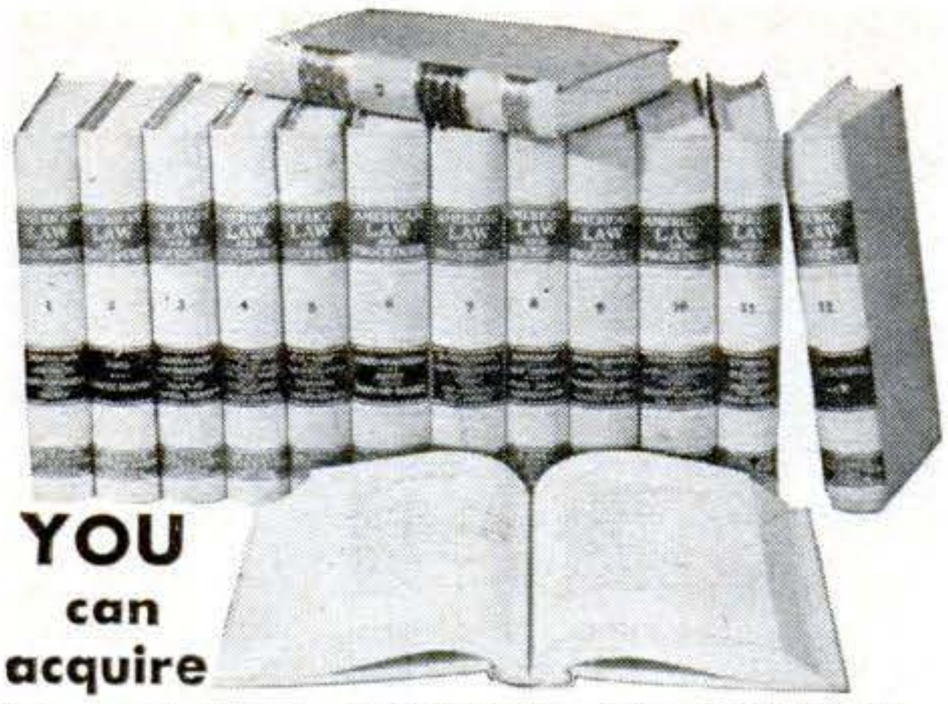

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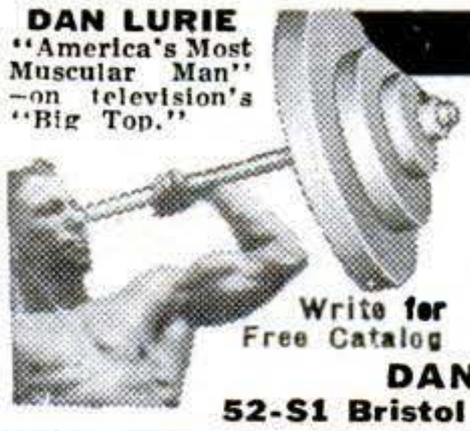

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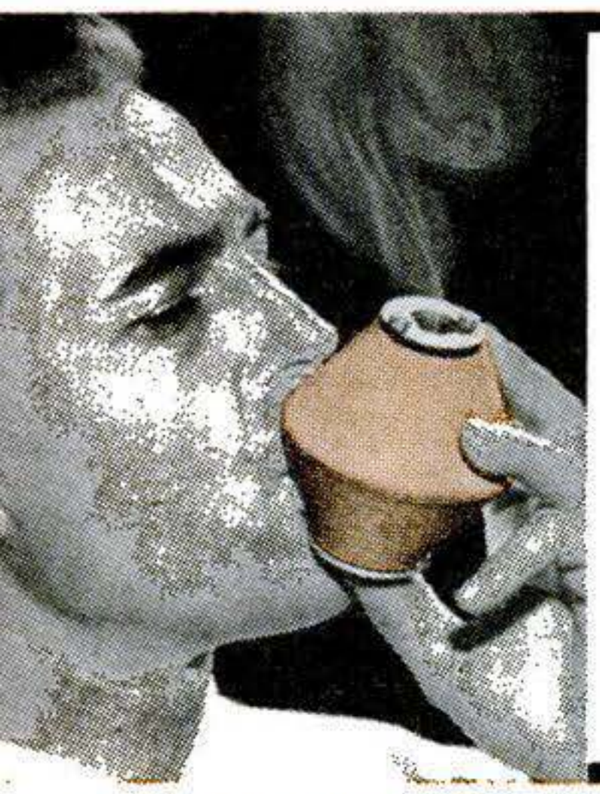

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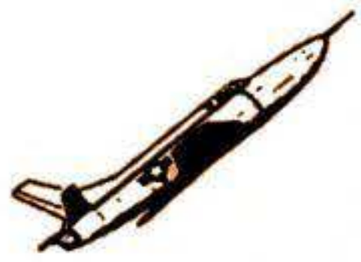

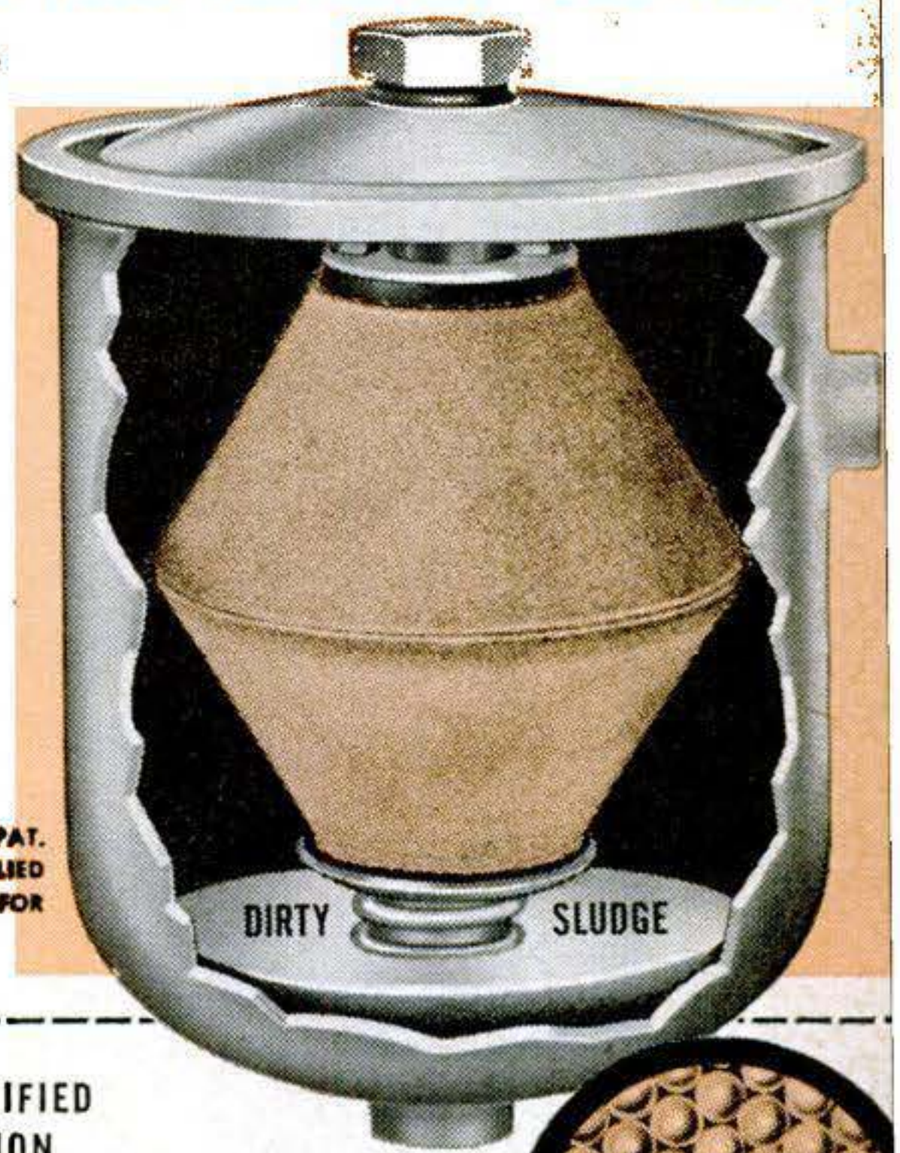

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CHANGE OIL ONLY ONCE A YEAR! *Here at last is an oil filter that never needs replacing... increases your engine power... ends monthly oil changes... adds thousands of miles to engine life... stops waste of valuable oil additives... and saves you worthwhile money in the bargain!*

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Millions of tiny bronze balls are fused or "sintered" together to form the astonishing, microscopically-fine filter screen that *never wears out!* Tests in huge gasoline and diesel trucks give conclusive proof that MICRO BRONZE type filters are the finest, most economical oil filtering units ever made.

MAGNIFIED PORTION of MICRO BRONZE filter showing microscopic metal balls fused together to make a solid, but porous, filter. MICRO BRONZE metal can't absorb additives, can't "channel," can't "blow," yet screens out finest particles of grit and metal which drop to bottom of filter housing as "sludge."

"FILTERS THE DIRT—BUT NOT THE DETERGENT!"

Major oil companies have developed heavy duty oils containing expensive additives and detergents that greatly reduce engine wear. Old-fashioned cloth, paper or earthen filters—standard equipment on many cars!—soak up these beneficial elements, but by-pass damaging abrasives and metal particles into the engine. The MICRO BRONZE exclusive double-cone design *filters out* abrasives and metal particles as microscopic as 39/millionths of an inch (one micron). Oil additives are *left in* to provide a protective film between moving parts. New MICRO BRONZE Oil Filters, combined with modern HD oils, *double your engine's life!*

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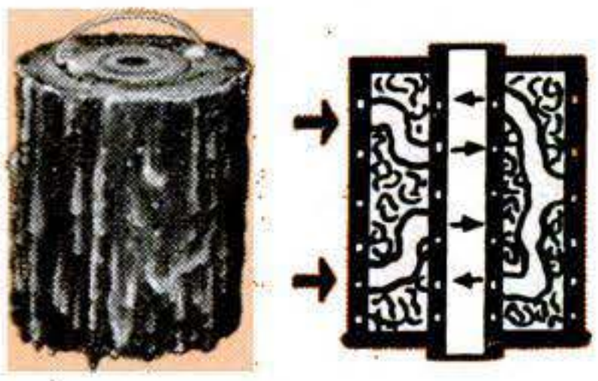

At left is shown an old-style filter "pack"—the kind that's probably in *your* car now. How can a dirty pack keep oil clean? It can't—actually contaminates your oil! Illustration at right shows how ordinary packs "channel" as a result of oil pressure, allowing dirt to tunnel through the pack and into the oil.

THIS MAY BE WORTH $10,000 OR MORE TO YOU!

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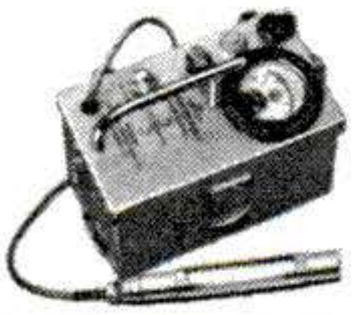

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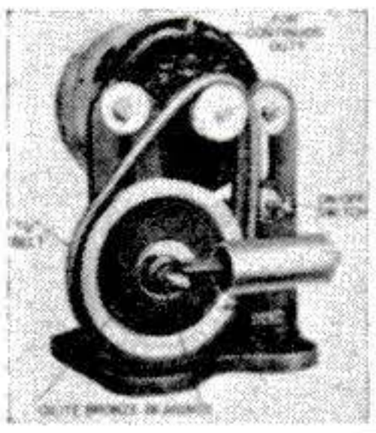

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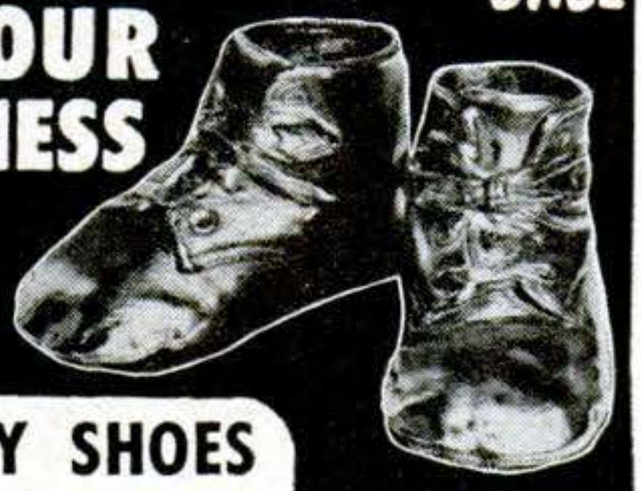

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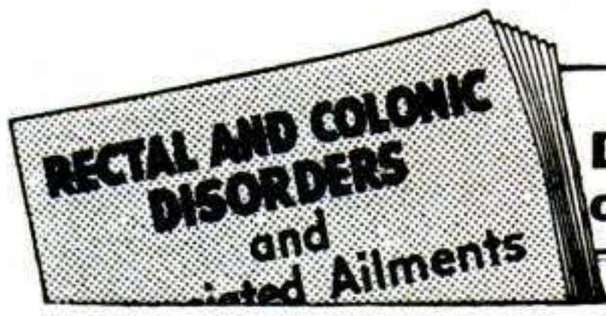

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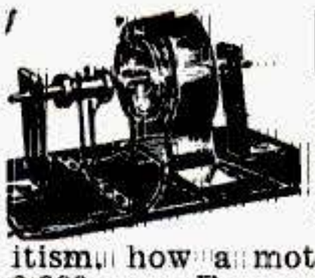

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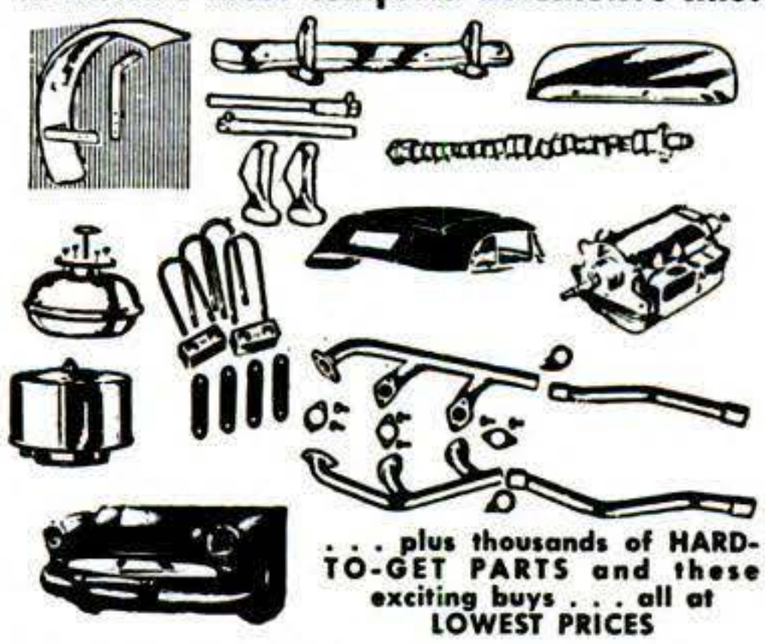

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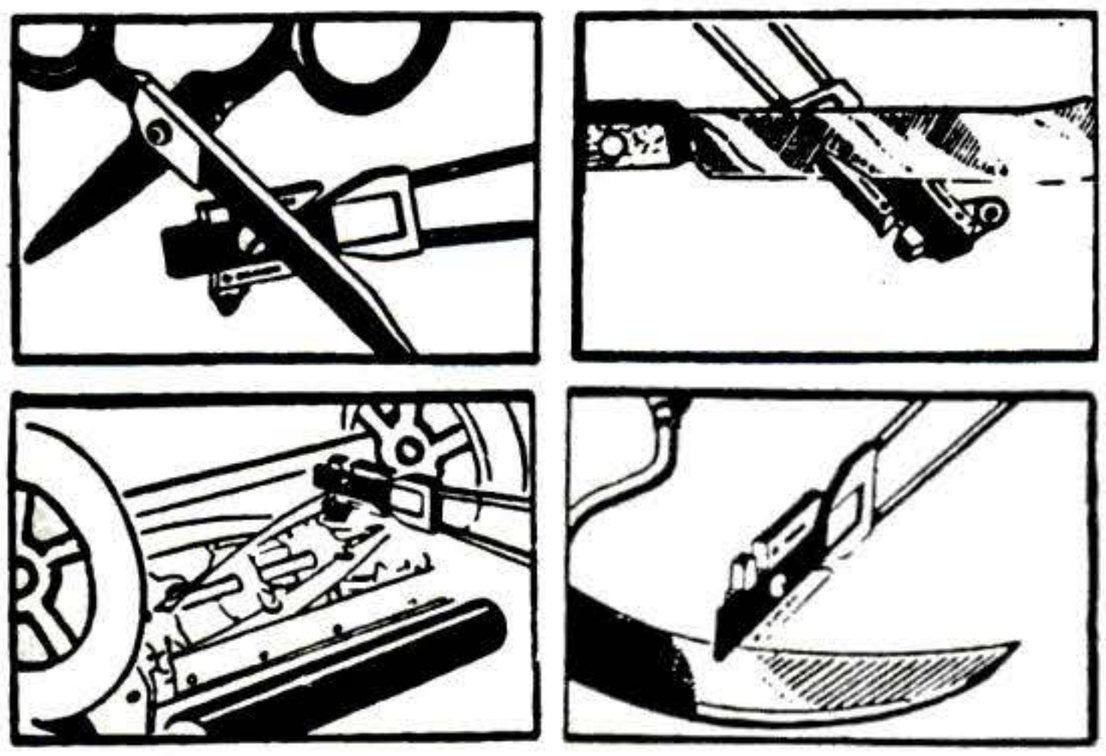

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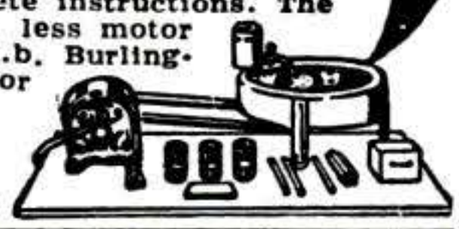

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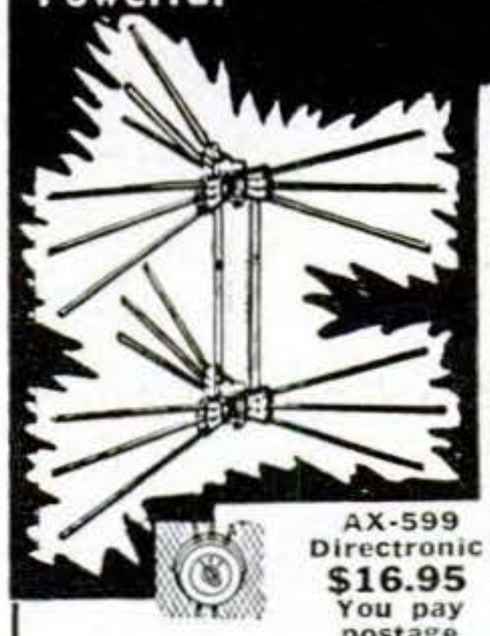

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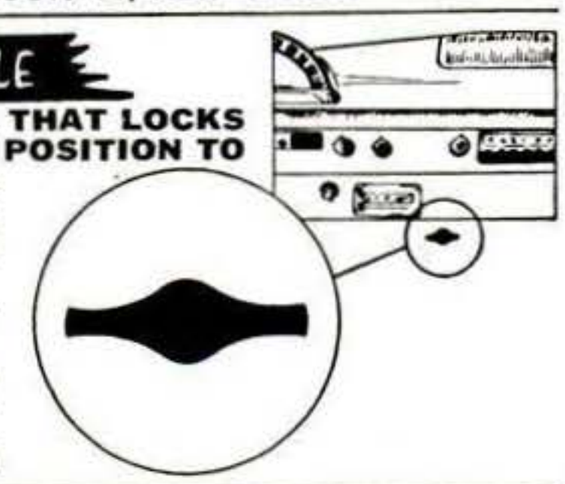

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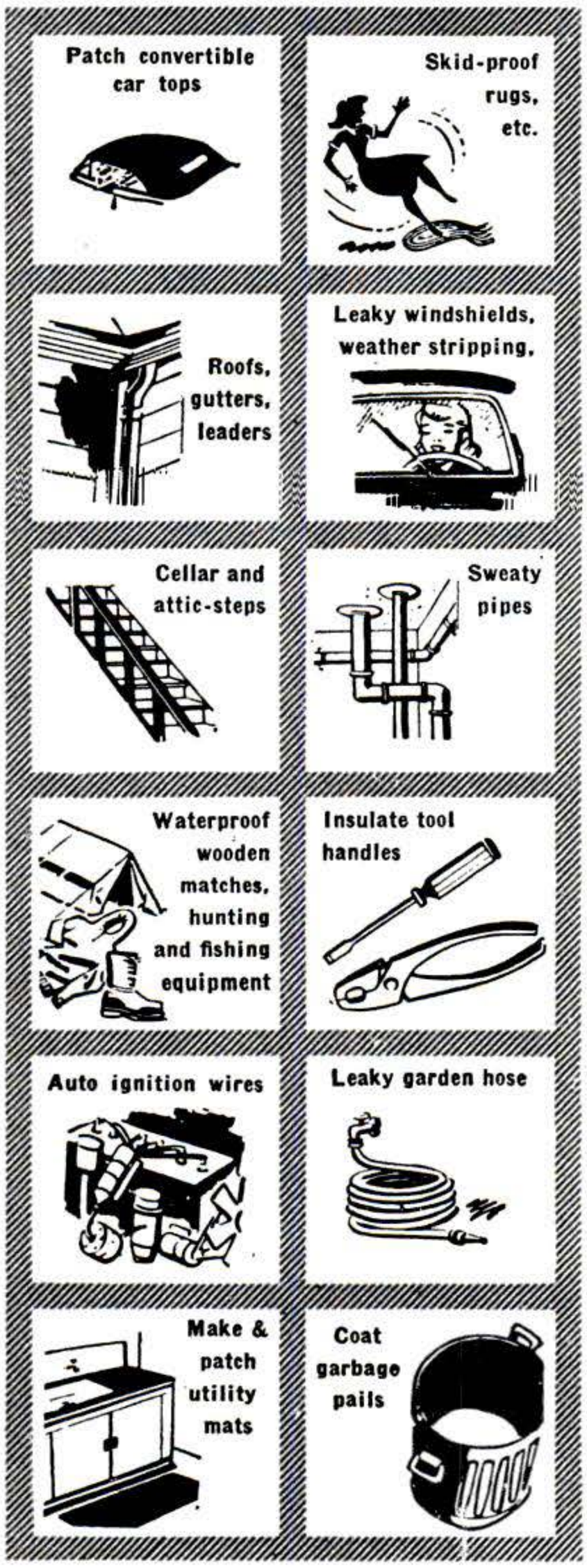

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DIP .. SPRAY .. BRUSH

INSULATES! SHOCKPROOFS! RUSTPROOFS!

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RUB-R-IZE, the natural liquid rubber, offers this 100% money-back guarantee: If RUB-R-IZE doesn't do everything claimed for it on this page, and MORE; if RUB-R-IZE isn't exactly what we say it is; and IF YOU ARE NOT 100% SATISFIED AFTER A THIRTY DAY TEST THAT RUB-R-IZE HAS DONE A WONDERFUL JOB FOR YOU...then return the unused contents of the can, and we'll refund your money. YOU be the judge; you risk nothing!

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Not only is RUB-R-IZE amazingly versatile when you want to mend or repair, *but you'll be astonished when you discover the number of things you can actually make with it!* Just dip, let dry, peel off, and PRESTO!—bathing caps for the entire family! Use several layers of RUB-R-IZE to make as good a shock-proof rubber heel as you'll ever want to have! Rust-proof leaky roofs, gutter runways, and leader pipes...

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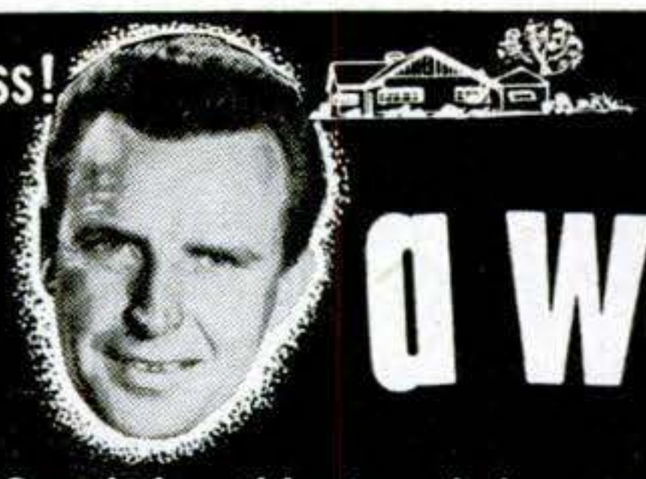

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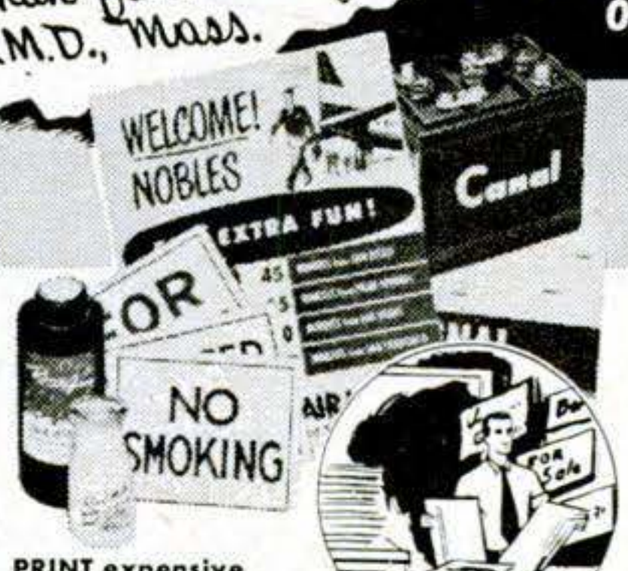

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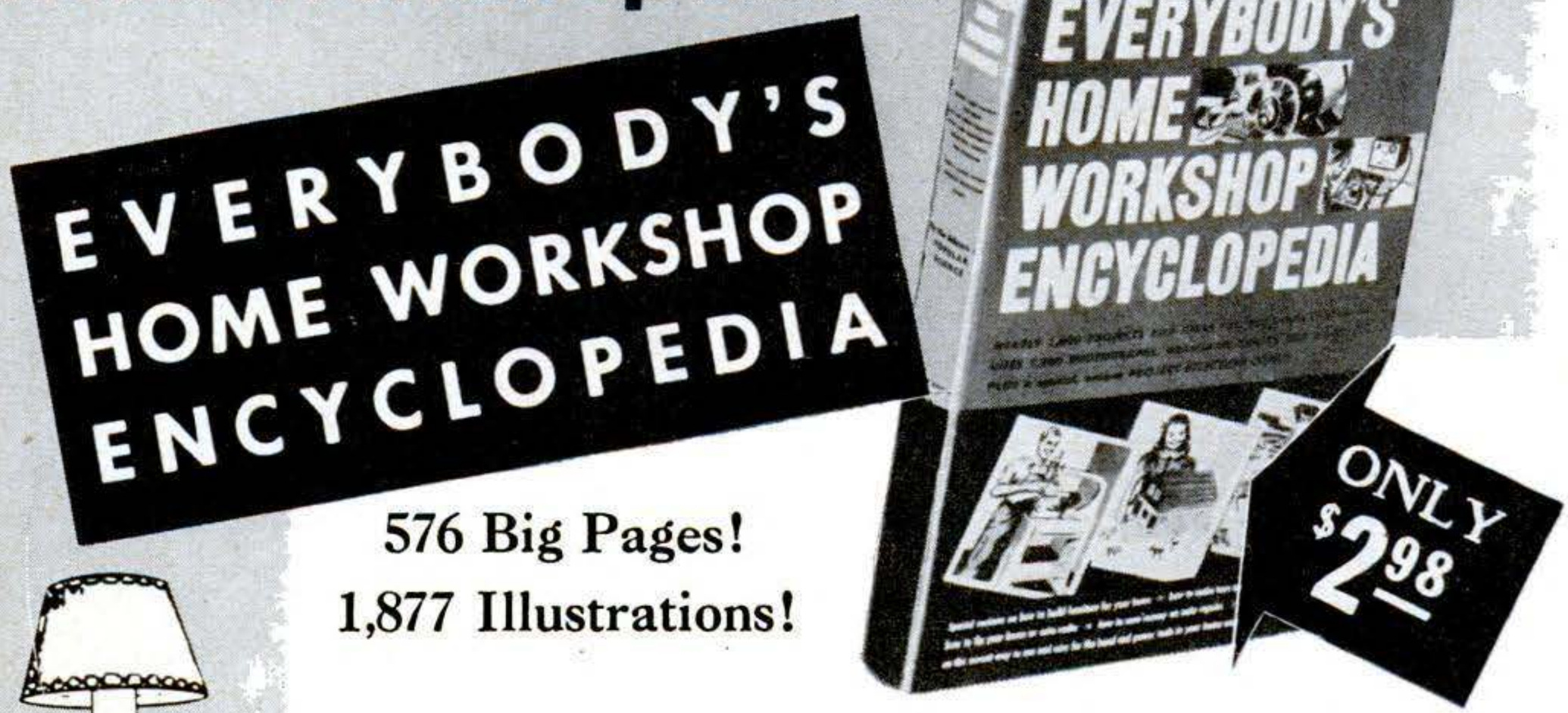

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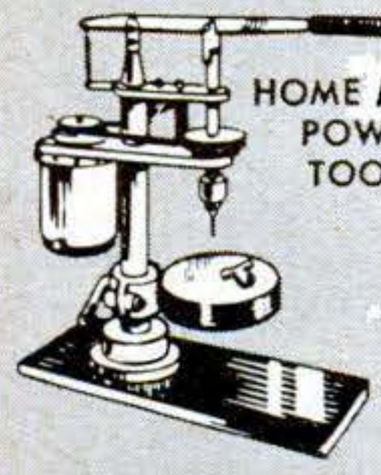

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700x15	4.85	820x15	5.55	650x20	8.85	1100x20	17.65
550x18	3.75	670x16	5.05	32x6(8)	11.75	1100x22	20.05
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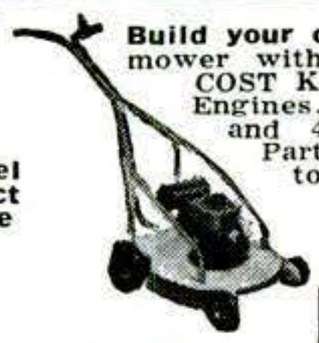

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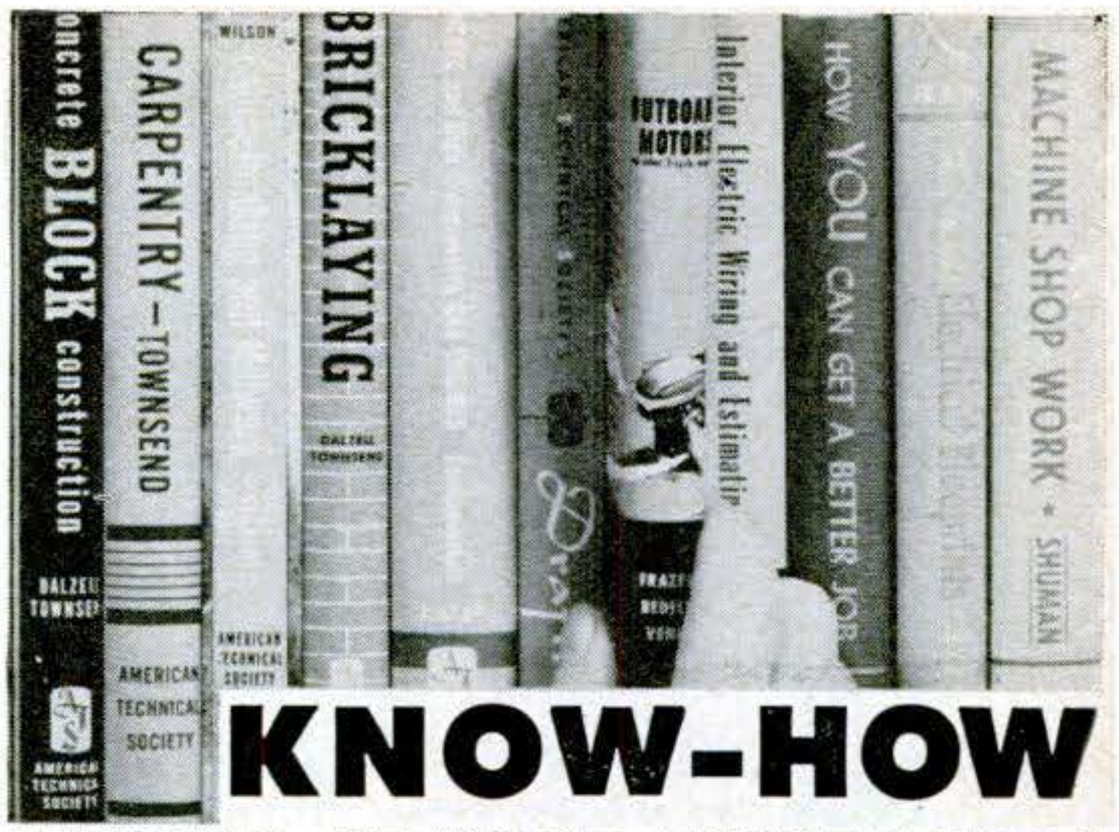

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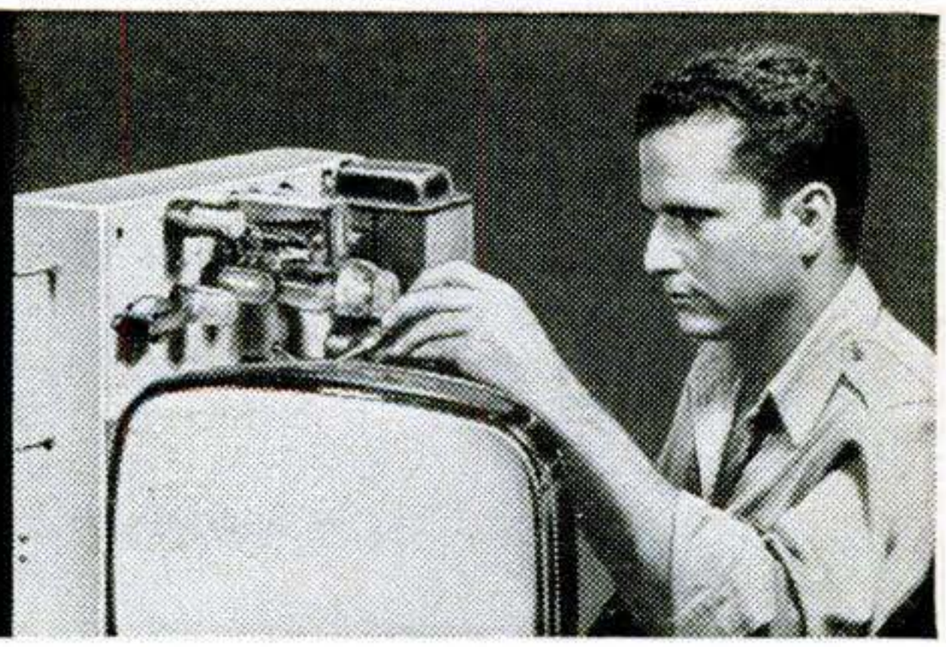

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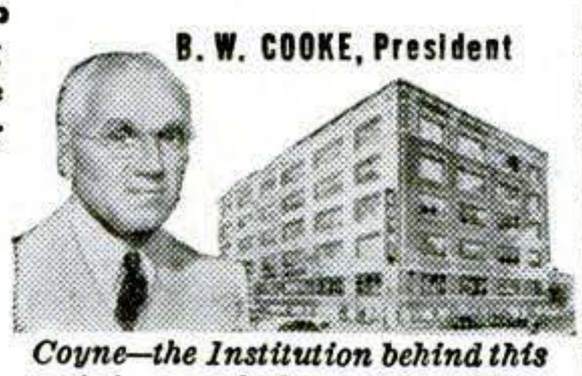

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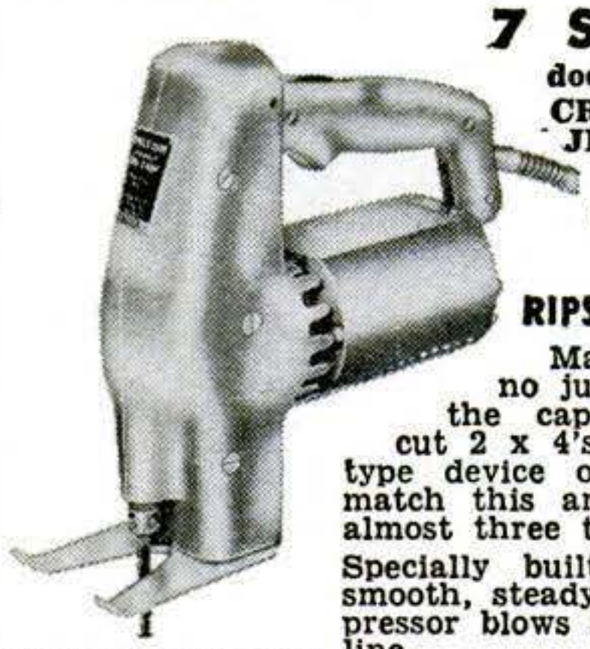

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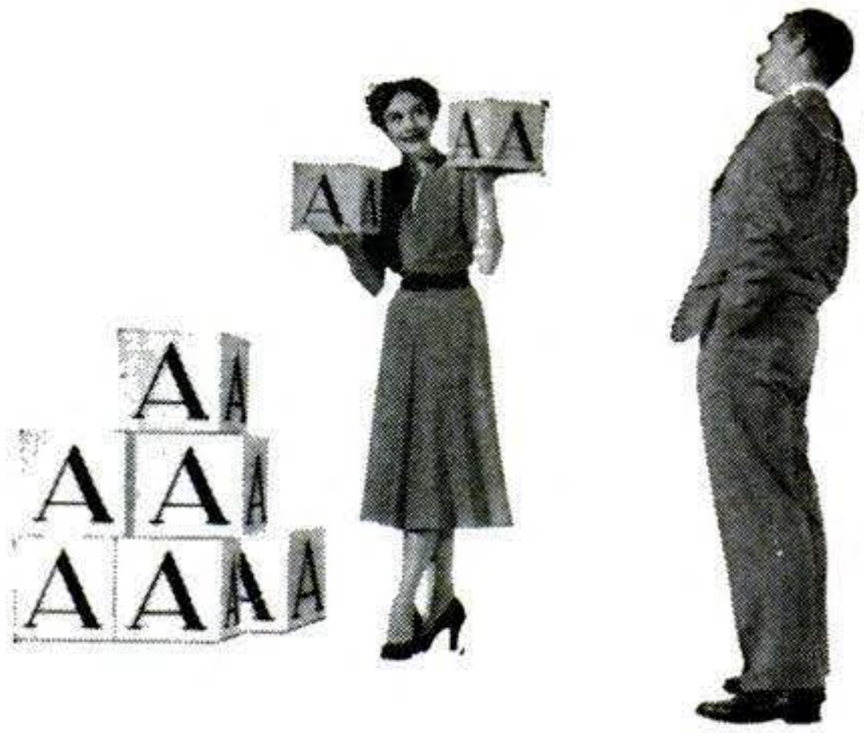

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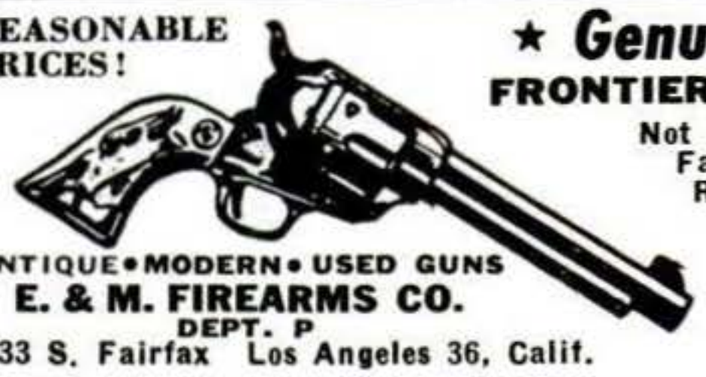

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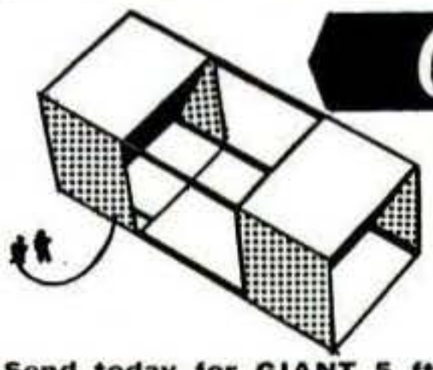

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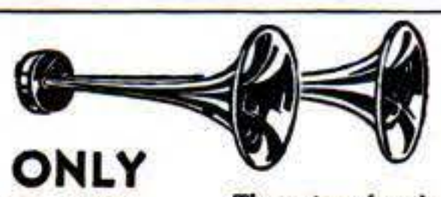

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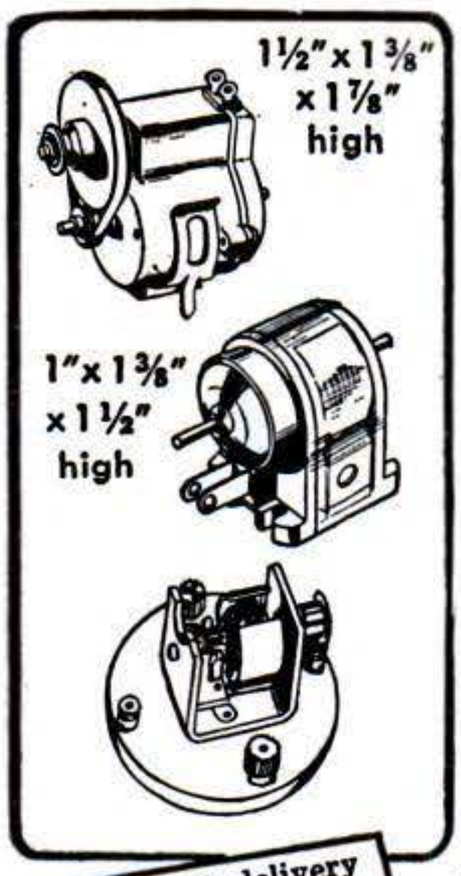

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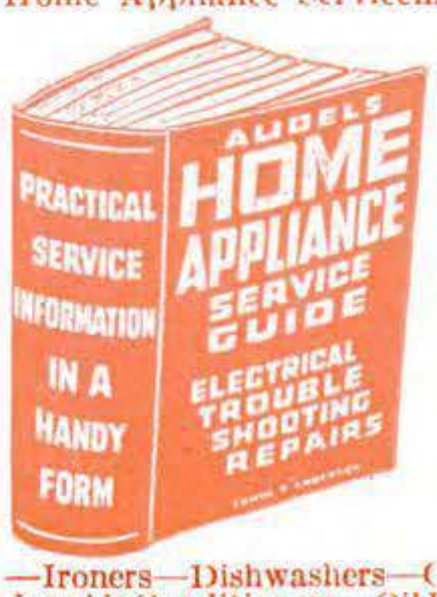

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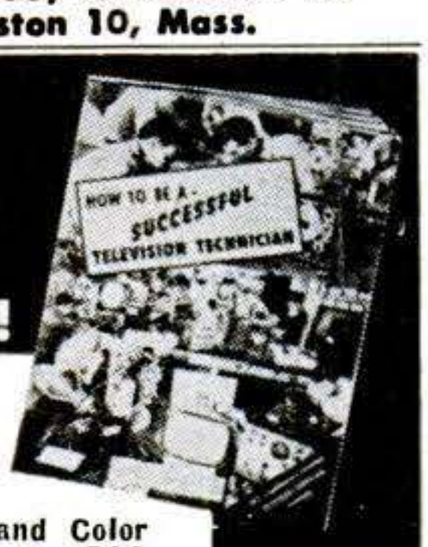

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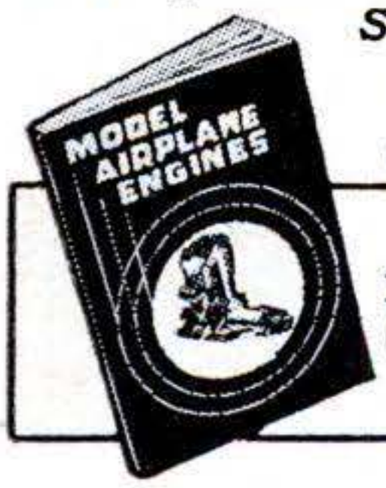

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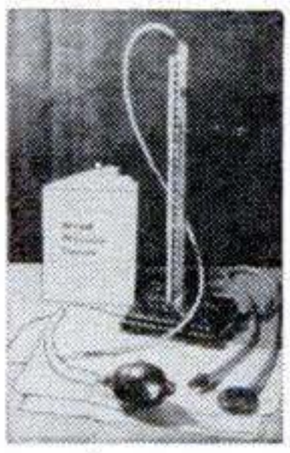

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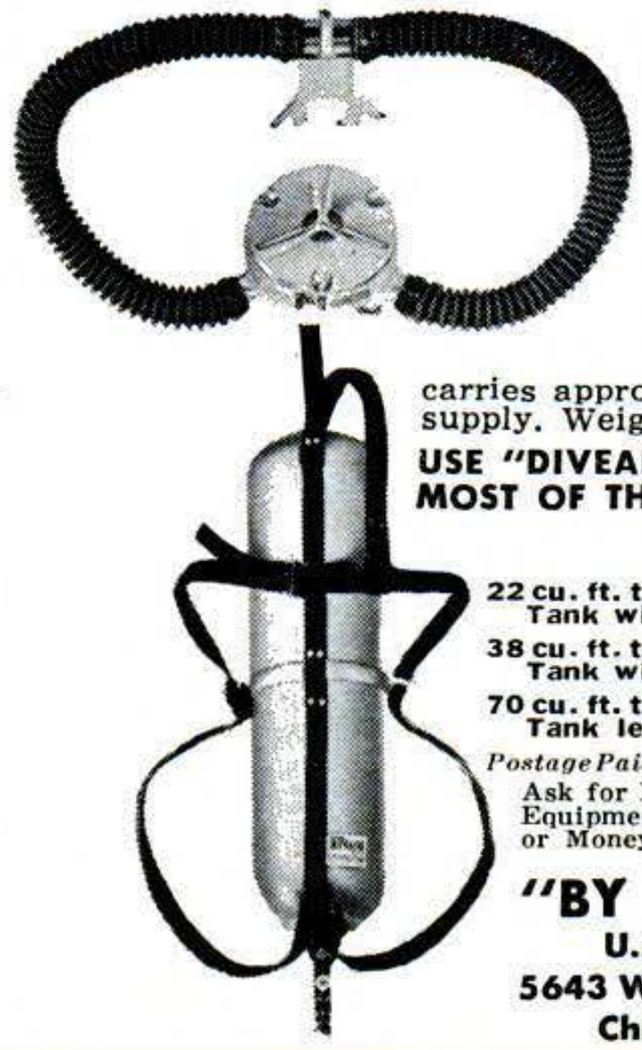

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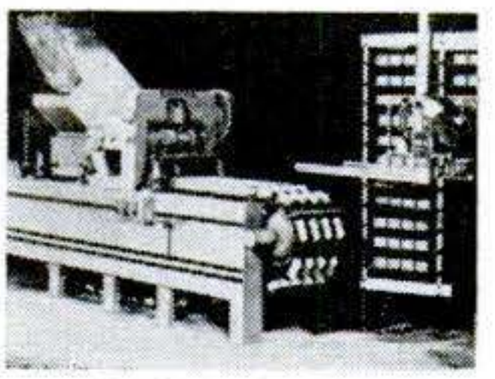

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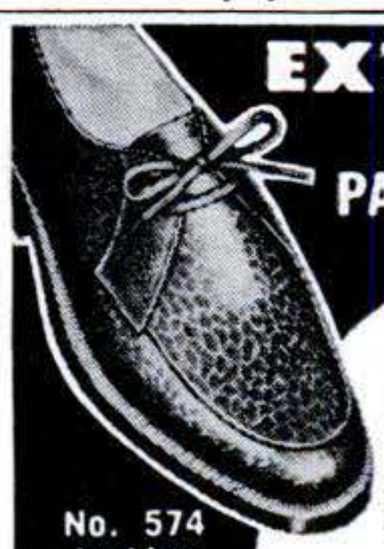

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It can be put anywhere in the house—in the kitchen, the basement, or the attic and it goes on making money for you whether you're there or not. Three times a day—while you're at work, while you're asleep, or while you're at the movies—it turns out a product that sells for $6.00 and the cost of raw materials is only 54c. It will make 3 a day or 6 a day, just according to the way you set the switch, and the profit on each one is more than $5. I'll be glad to tell you how to get one of these little money makers working for you.

By Jack K. Mason

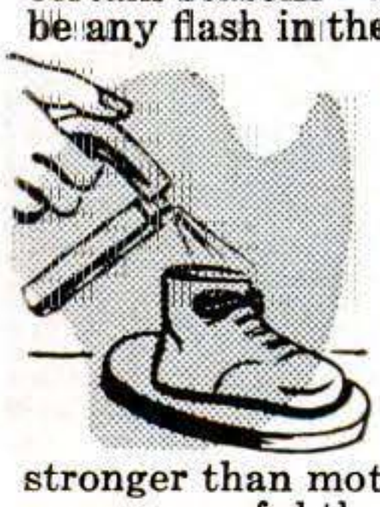
What a fellow makes in his regular job today is hardly enough to make ends meet. Higher taxes, higher costs of food and rent and almost everything else raise hob with the savings account. And I say that what a fellow puts away is even more important than what he makes. It would worry me sick if I couldn't save a little against a rainy day.

And that makes it almost necessary to make some extra money. There are lots of ways to do it, too. The magazines and newspapers are full of ads for agents to sell things. But if I had to make a living by selling, from house-to-house, I'm afraid I'd starve to death. I like to make something with my hands and either sell it by mail or let the stores sell it for me. There are lots of people like me.

Another thing: Lots of men—and women, too—don't want to get mixed up with something that might hurt them on their jobs. They want a plan they can operate at home—in spare time—one that they can work at any time they please and one that doesn't need any rented store or hired help. And that's where my little money maker rings the bell.

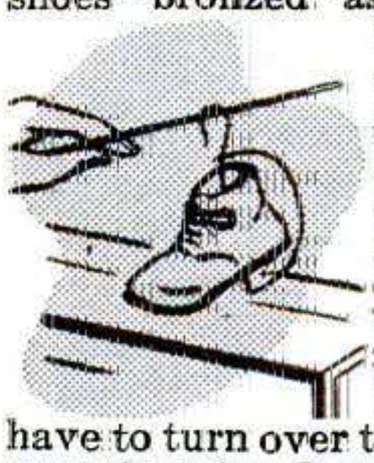
Let's say you're like me. You want to make some extra money but you don't want to do any selling. All right—take a look at what you can do with this machine. I'll give you some facts that I discovered and your own common sense will tell you they're true.

If you're going to make something, it ought to be something that lots of people want—something that lots of people buy. It shouldn't be something that sells at just certain seasons—but all year 'round. And, it shouldn't be any flash in the pan. It's got to be steady—year after year—something that's not here today and gone tomorrow.



Well, give a thought to this: What's more permanent than babies? Ever since I can remember there's been more and more babies born every year. Last year three and a half million. This year more. Next year, more yet. Then answer this question and tie it in with your thinking: What's stronger than mother's love for her baby? And what is more powerful than love or sentiment in making people buy things. Now you've got the idea.

Every year millions of mothers want their babies' first shoes preserved as mementos. These mothers have the shoes "bronzed" as they call it—by electroplating. Electroplating coats the shoes with copper and preserves them forever. And there's no big company that has a corner on the business of metalizing baby shoes. Almost all of this work is done by little fellows in their kitchens or basements. Lots of orders come to you by mail when you send out circulars letting mothers know you can do the work. Lots of stores take orders, but they have to turn over the work to you. There are six or seven ways to get orders without making any house-to-house calls. The big job is keeping up with them.



You see, you can clean up six pair of shoes in a few minutes. In a few minutes more you can dip them in the hardening solution like you see in the picture. Then you spray them with a conductive coating and hang two pair in the tank on copper wires. Just turn the switch and walk away. The machine does the rest. Eight hours later those shoes are ready to take out of the tank, burnish and mount and ship or deliver. Two pair every eight hours, whether you are asleep, awake or at the movies. The materials cost 54¢ a pair. The retail price you get for electroplating is $6.00—so the profit is more than $5.00 a pair. Since you can do six pair a day you can see what the profit is, and the beauty of it is that the machine doesn't cost much. Almost anyone can afford the equipment and the book you get tells how to run the machine and how to get orders. Anyone can follow the instructions.

Of course, there's a lot more information than what I can give here. But write me a note or send me a postcard with your name on it and I'll send you all the information right away by mail. I'll show you how to start; what you need to buy; where to get it at the lowest price; how to get orders coming in seven different ways; and everything you want to know about the business. When you get all the facts, you can decide whether you want to get a "little money maker" of your own. Everything I send you now is free—no charge and no obligation. I'll be glad to help you get a start. Address me, **Jack K. Mason, 1512 Jarvis Avenue, Chicago 26, Illinois.** There's no catch to it. No one will call to try to sell you anything. I'll mail everything free, postage prepaid. Then you can decide. Write to me right away so I can help you get started making money.

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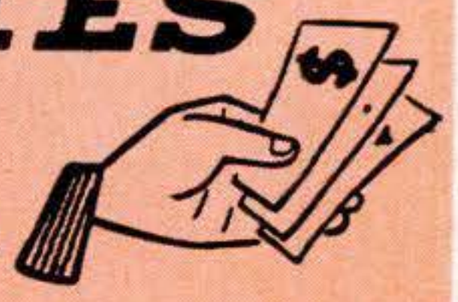

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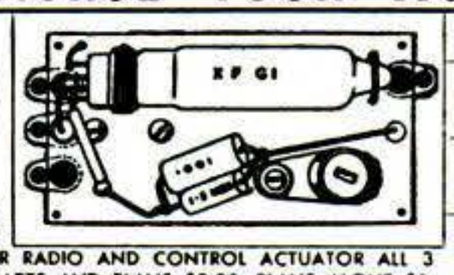

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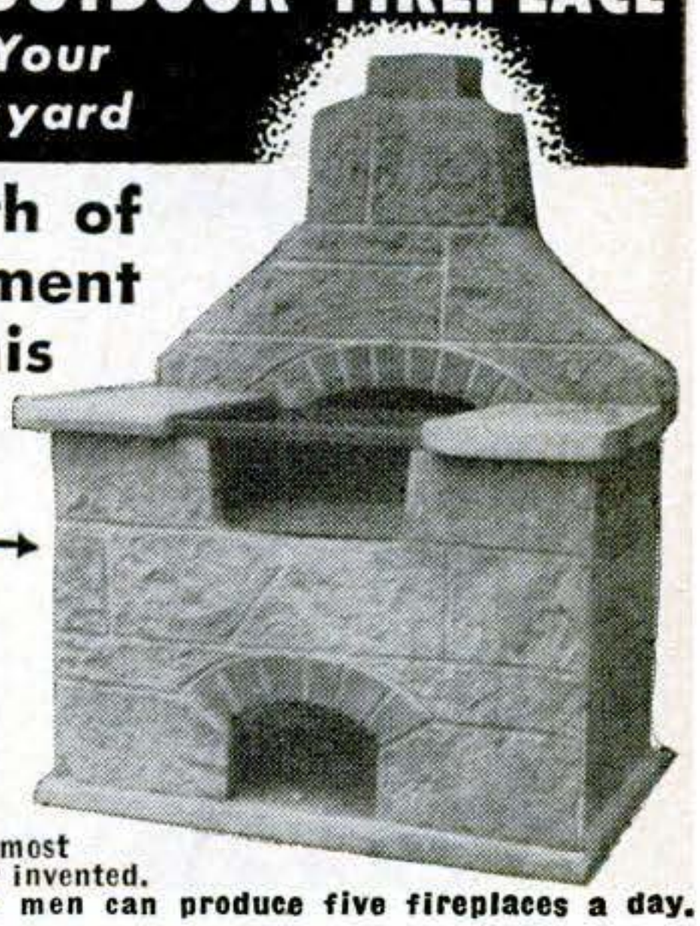

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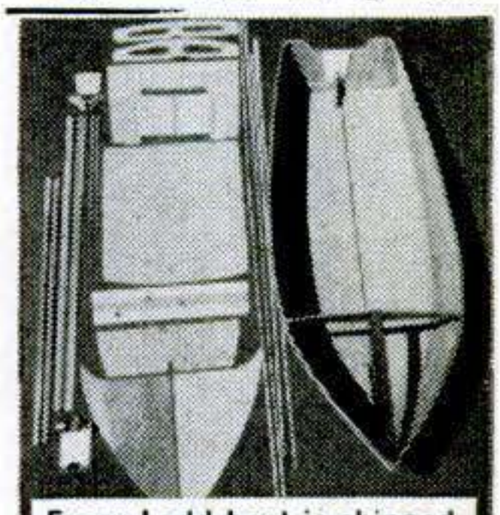

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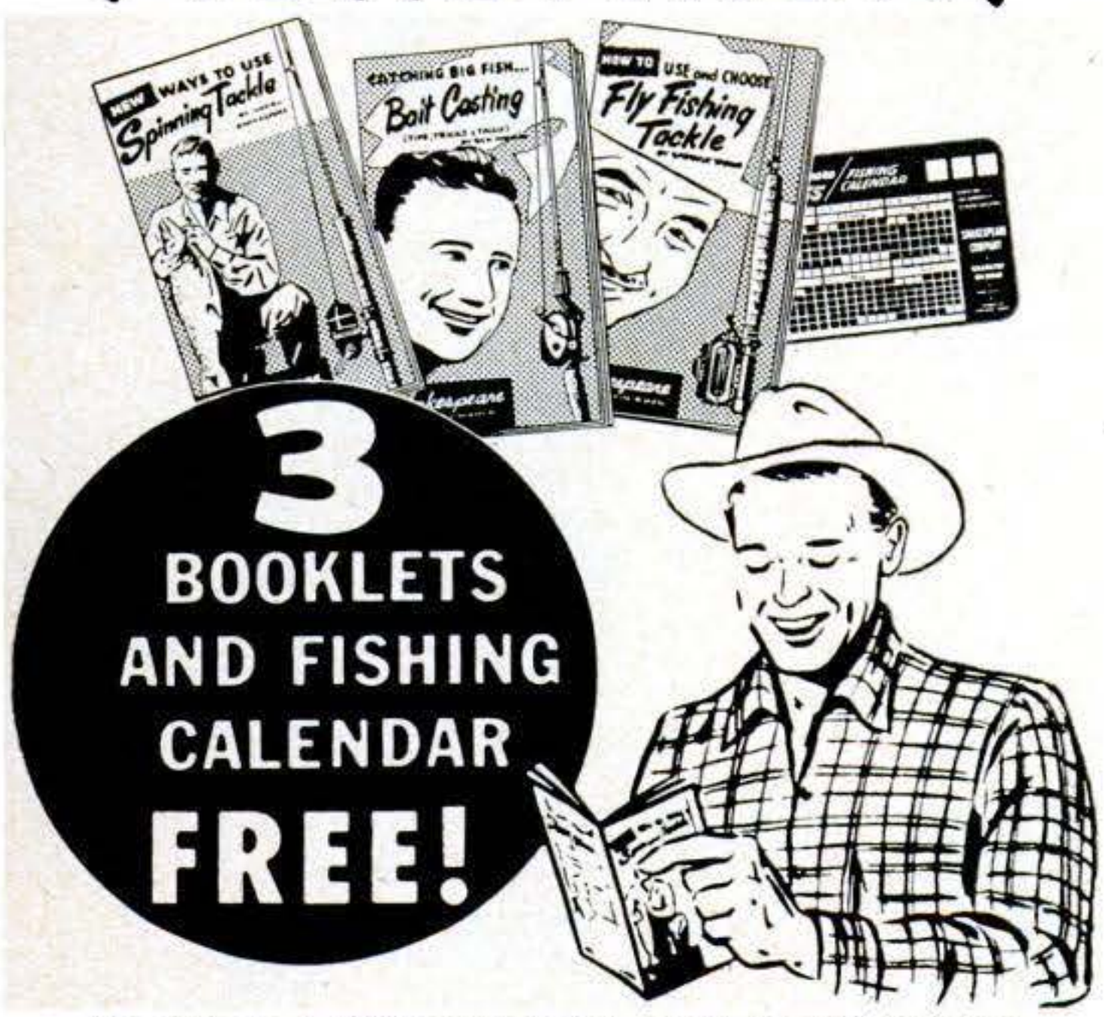

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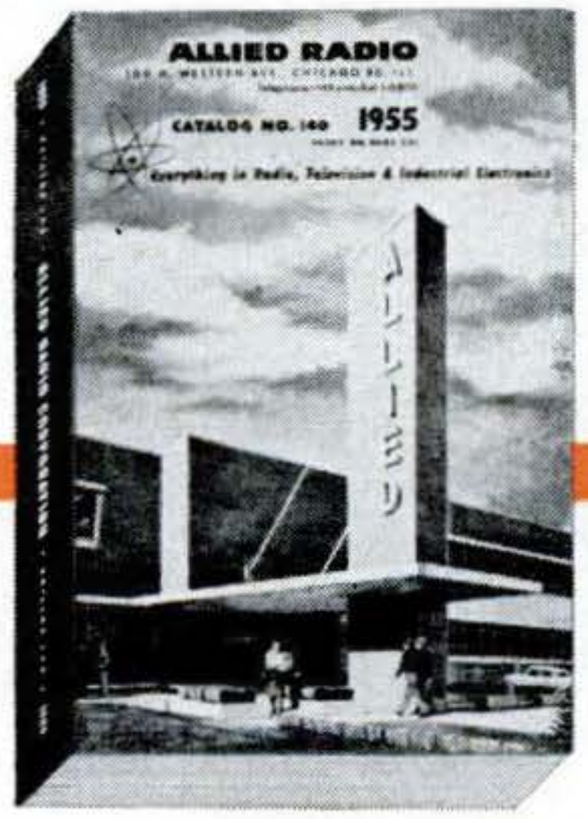

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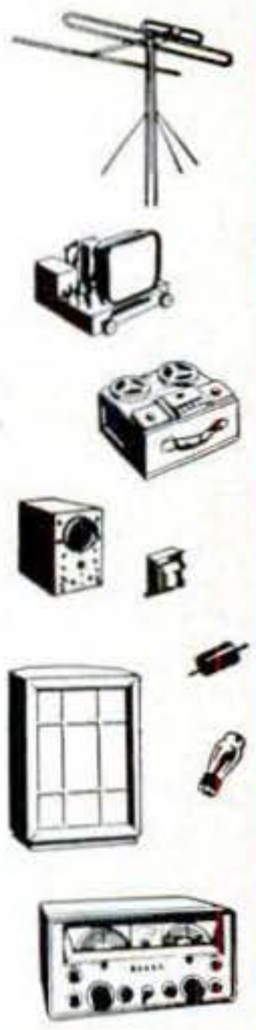

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★ **5 to 9 more horsepower**

★ **27% more miles per gallon**

★ **Smoother Idling**

Faster Pickup

70,000 Miles Without an Overhaul

...from any make, any model, any year car!

A few months ago, a fleet of test cars pulled off the proving ground track and into the shops of one of the largest automobile manufacturers in the world. Outwardly, these cars still looked identical after their endurance runs. Then the mechanics tore down the engines and miked the bearings, rings and pistons. Most of them were ready for overhaul. But some of them *still had three more lifetimes to run!*

Special lubricants? They were all using oil you could buy anywhere for about 40¢ a quart.

The secret? Better oil filtration. Here's why: the moving parts in your engine never touch each other. They're always separated by a thin film of oil. Keep abrasives from getting into that film of oil and, *theoretically,* your engine should never wear out.

Today, the development of two inventions makes it possible for any engine to approach the life and performance that engineers know is theoretically possible. Here are the two inventions:

One is a simple $3.95 Fuel Monitor designed to give you improved carburetion, more miles per gallon, smoother idling and increased speed and power.

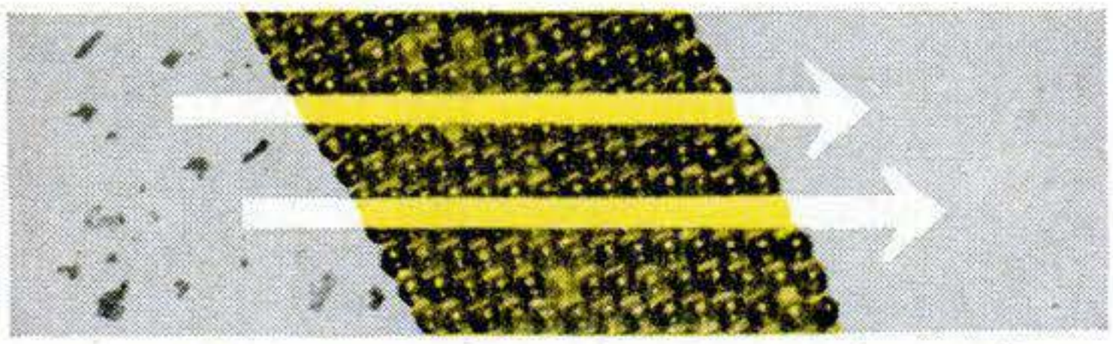
The other is a revolutionary anti-acid, anti-friction Life-Time oil filter which has already increased engine life to 250,000 miles in highway tests.

Both of these inventions are possible only because of the discovery of an amazing metal—sintered bronze.

What is Sintered Bronze and What Good is it?

We make sintered, or porous, bronze by fusing together millions of tiny bronze balls under heat and pressure. The result is an extremely fine screen—much finer than any screen that could be woven of metal or even cloth.

Originally, sintered bronze was used mainly to filter liquid oxygen and other extremely cold rocket and jet fuels, plus superheated gases.



Carbon and abrasives can't get through spaces between bronze balls; oil stays dark, proving no additives have been removed.

Our engineers used this experience to pioneer the development of the Life-Time° automotive filter you have read articles about in magazines like this one.

The Life-Time Fuel Monitor: How it Works

If you've ever dropped a lighted match into a pail of gasoline, you know that *gasoline won't explode.* Only gasoline *vapor* will explode. The more raw, unvaporized gasoline your carburetor delivers to the cylinders, the more gas you waste. The more highly vaporized a mixture your carburetor puts out, the more mileage and power you get from your gasoline.

Increased Vaporization

Most improved carburetors try to increase vaporization by doing something to the gasoline *inside* the carburetor. The *Life*-Time Fuel Monitor simply tackles the same problem in a different way *before* the gasoline gets to the carburetor. Attached to your carburetor just like an ordinary gas filter, the *Life*-Time Fuel Monitor has a porous bronze element which:

(1) removes water from gasoline, plus tiny amounts of low-volatility petroleum tars which interfere with complete vaporization;

(2) tends to equalize gasoline pressure;

(3) removes gums, rust flakes and other impurities before they can foul carburetor jets permanently or even momentarily. Result: you save $20-$35 in periodic carburetor cleaning expense, and get improved mileage and performance.

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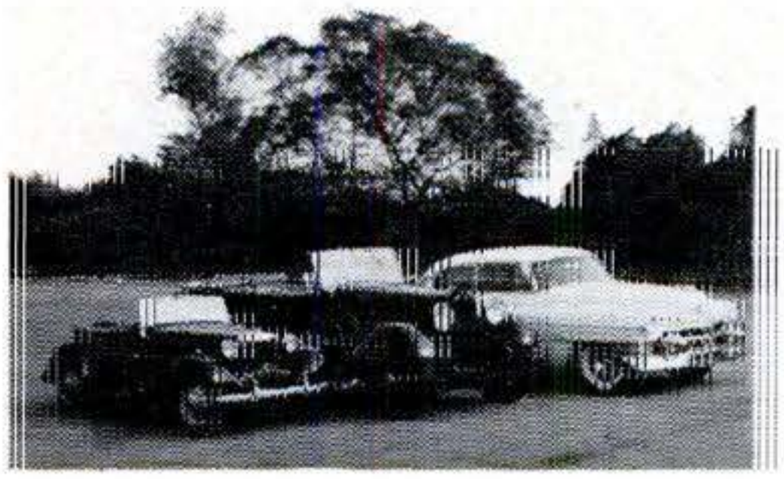
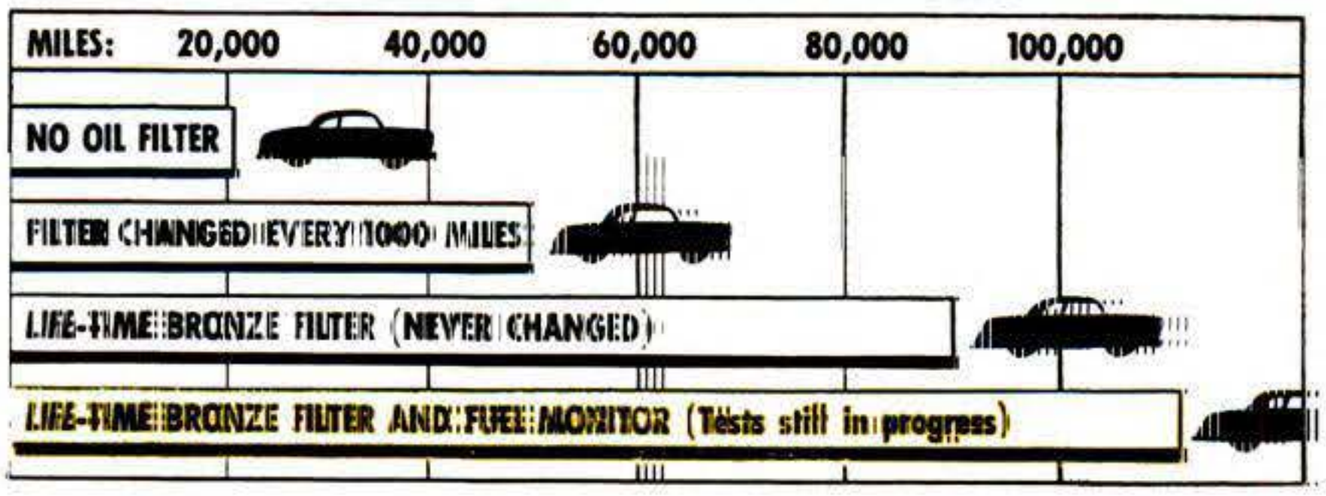


MILES BETWEEN OVERHAULS

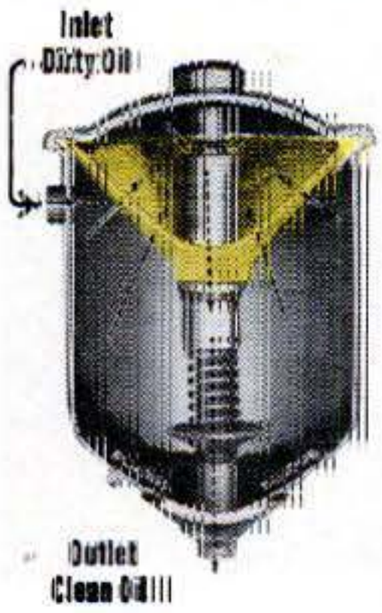


ROAD TESTS *in cars of all makes and models prove engine life is virtually unlimited when gums, tars and damaging abrasives are kept out of oil and fuel systems.*

Genuine Life-Time Oil Filter Gives Your Engine 250,000-Mile Protection Against Acid, Abrasive Damage

Here's the original, genuine *Life*-Time® permanent bronze oil filter tested and approved by the editors of leading automotive and scientific magazines. The only bronze oil filter ever to pass government shock and vibration tests, the genuine *Life*-Time® filter removes *all* abrasives—including granular, diamond-hard carbon which gets through other filters—plus acid-producing water. In addition to *preventing acid formation*, the *Life*-Time oil filter has a special acid-neutralizing component which *actually destroys residual acids that have already formed in your oil system.*

How the Life-Time® Oil Filter Works



Test vehicles have already exceeded the 250,000 mile mark with the *Life*-Time® filter. You never change it; just rinse it out and it is good as new.

Dirty oil enters at top. Impurities, stopped by bronze screen, fall to bottom of case. Filtered oil, including additives, returns to lubrication system.

Try the Life-Time Fuel Monitor and Life-Time Oil Filter for 30 Days at Our Risk!

You can try either or both on this guarantee: you must be convinced they do everything we say, or money back, no questions asked!

For complete *Life*-Time oil filter unit, including case (fits any car), send make, year and model of your car and $12.95 (we pay shipping).

Life-Time oil filter conversion kit, which replaces your present filter pack with Life-Time bronze, is $6.95 for most cars (send make and number of present filter when ordering). Conversion kits for Buicks with hydraulic lifters and for cars with full flow systems: $13.95.

Or send only $2 deposit, pay C.O.D. charges on arrival. But do it today—don't waste another cent on filter pack replacements!

To try the Life-Time Fuel Monitor, simply send $3.95 (we pay postage) or send $1 deposit, pay C.O.D. charges on arrival. If you're not convinced in 30 days it's worth four times the price: money back, no questions asked!

*Don't confuse the original, genuine *Life*-Time filter with imitations and "improved" substitutes. Only the original, genuine *Life*-Time filter has passed government shock and vibration tests and meets military filtering requirements. Look for this trademark: LIFE-TIME

DEALERS AND DISTRIBUTORS: find out how you can cash in on demand generated by two-page and four-page ads in national magazines, plus radio and TV network shows and full-page newspaper ads. Write today for full information on *Life*-Time Fuel Monitors, Oil Filters, Batteries, Spark Plugs and Power Brakes. Continental Manufacturing Corporation, Dept. CPS-1, Washington Blvd. at Motor Ave., Culver City, California.

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Gentlemen:
I will road test the products checked below in my _____
(make, model, year of car)
(___) Fuel Monitor ($3.95)
(___) Oil Filter ($6.95 for conversion kit; $13.95 for full-flow; $12.95 for complete unit, including element)
I enclose (___) cash; you pay shipping
(___) $2 deposit; will pay C.O.D. charges on arrival.
You will refund my money for either or both products if I return them within 30 days.

Name _____
Address _____
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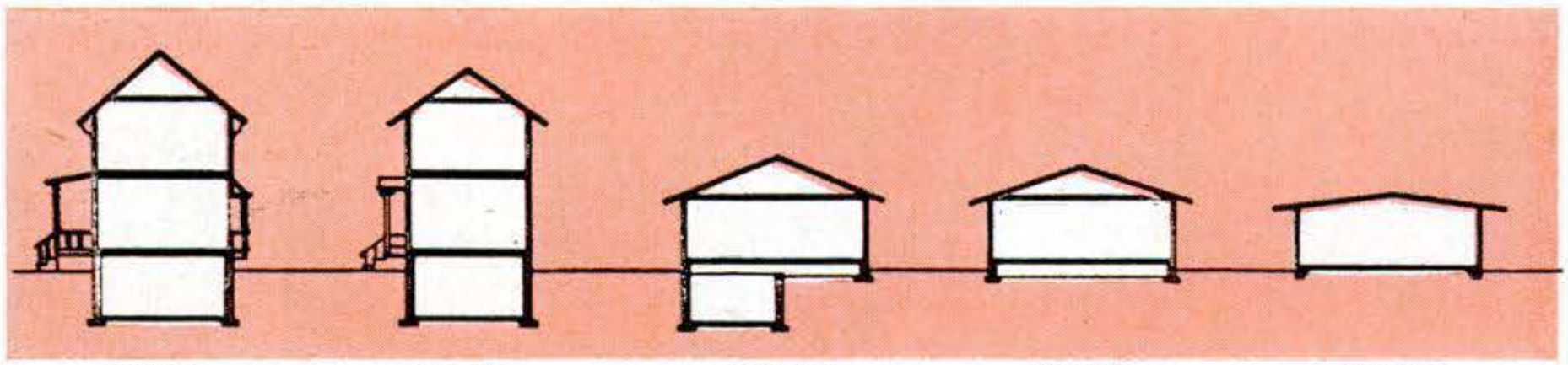
POPULAR SCIENCE MONTHLY'S . . . Last-minute news & notes

THE MYSTERY OF THE COMET JET-AIRLINER CRASHES has been solved in one of the most elaborate feats of scientific detective work ever attempted. The culprit: metal fatigue. Under repeated stress, the plane's skin cracked around a window, the fuselage broke open, and the pressurized atmosphere inside blew everybody out. How did researchers find out? First, the Royal Navy scoured the bottom of the Mediterranean with undersea television cameras, located and raised nearly all of one plane. Some fragments were matchbox size. Second, a Comet was test-flown as near to a crash as possible. Third, a perfectly good Comet ($1,200,000) was submerged in a water tank on the ground, its cabin filled with water under pressure, while the wings--which stuck out of the tank--were wiggled by jacks to imitate a bumpy flight. After the equivalent of 9,000 hours' flying time, the fatal crack at the window occurred and the cabin exploded.

THE AVERAGE AMERICAN HOME HAS SHRUNK from 1920's two stories plus basement, attic and porches to 1950's one story with 25 percent less living area. This is revealed by a Stanford study just released by Weyerhaeuser Timber Co. By 1960 even the ceiling will be gone.



1920	1930	1940	1950	1960
3½ FLOORS	3 FLOORS	1½ FLOORS	1 FLOOR	1 FLOOR

Actually this seemingly black picture is progress. Far more people now own homes (more than 50 percent, most of them free and clear) and each house accommodates fewer persons. And with improved design, a modern small house may contain more useful area than a big old one.

MASS-PRODUCED CARS ARE CUSTOM JOBS. People demand so many variations in color, style, trim and equipment that Mercury alone could make 558,194,688 autos, no two alike . . . A NEW PHOTOCELL GADGET lights up billboards when a car comes by. Headlights trigger the device, made by Tork Clock Co., Mount Vernon, N. Y.

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M. R. Stanley

"For Easy and Profitable Selling PRESTO Can't Be Beat"

"Presto is the easiest selling and most profitable item I have ever sold or seen. My selling time actually shows me a profit of $20.00 to $25.00 per hour and I have yet to put in a 6-hour day without showing a profit of over $100.00."
—*M. R. Stanley, Montana*

Made $175 in First 5 Days

C. S. Melious

"My first week my profit was $175.00 for the 5 days. I have hit as high as $44.00 profit in one day. Every sale is a thrill. I am certainly pleased and happy as it is the most and easiest money I ever made in my life."
—*Cordian S. Melious, New York*

S. Hyman

Made Over $1000 a Month—Calls Sales "Automatic"

"PRESTO is the fastest money-maker ever produced. If a man demonstrates intelligently, sales follow automatically. I have made an excellent living with the PRESTO, having made over $1000 a month."
Stanley Hyman, New York

Made $28.35 in 3 Days

Glenn E. Herbert

"Presto is great! I made $28.35 in 3 days, working only *part time!* Then I reordered. I should have reordered immediately, and my profits would have been greater. I won't run out of Prestos again! When they see Presto actually put out a fire, everyone wants it!"
—*Glenn E. Herbert, Missouri*

Sells Average of 100 PRESTOS a Week—Part Time

R. H. Taber

"PRESTO is in a class by itself, small, but mighty easy to handle, good on any kind of fire. My biggest week—two gross. My average sales on part-time basis—100 a week. Real salesmen putting in 8 hours a day can make a real week's pay selling PRESTO fire extinguishers."
—*R. H. Taber, New Hampshire*

Over $10 Profit an Hour—In Spare Time

H. Sadler

"Unfortunately, I am unable to devote my full time to this remarkable line. To date I have put in 5½ hours of work—at a profit to me of over $10 an hour!"
—*Hugh Sadler, New Jersey*

W. Wydallis

AVERAGES $15.20 an Hour

"The 'natural' of this decade is the PRESTO FIRE EXTINGUISHER . . . because it is handy in size, simple to operate, and in the right price range. For every hour I have devoted to PRESTO I have earned an average of $15.20 an hour."
—*William F. Wydallis, Ohio*

H. J. Kerr

"At Least 20 a Day"

"I am selling a greater service at a lower cost than has ever been possible before . . . Every demonstration is a thrill and keeps me interested so that selling does not become monotonous. I really make $20, at least, every day I work."
—*H. J. Kerr, Pennsylvania*

C. Kama

No Sales Experience—Made Over $1000 a Month!

Charles Kama of Texas had NO sales experience until he took up PRESTO. He did so well that he was featured as "Salesman of the Month" in a national sales magazine. In an interview he said: "I think I've succeeded pretty well. I'm making more than $1000.00 a month—and I haven't touched bottom yet."

WHO ELSE WANTS TO MAKE A WEEK'S PAY IN A SINGLE DAY!

Men From Coast to Coast Are Making Money "Hand Over Fist" Showing Science's New "Midget Miracle" Presto Fire Extinguisher

OVER TWO MILLION ALREADY SOLD!

WOULDN'T YOU like to be making the kind of money these men are making? Their stories (printed above) are examples of the brilliant success that *Presto* salesmen are enjoying. If so many men—some of them *without previous sales experience*—are doing so well, it *proves* that Presto is a "natural"—a red-hot product that ACTUALLY SELLS ON SIGHT!

What Is the Secret?

Presto contains an amazing new chemical—"Chlorobromomethane" or "C.B." The Germans developed "C.B." as a secret defense against fire during the war. After the war, a famous American firm, the Dow Chemical Company, acquired the formula from the U. S. Government and began manufacturing it here. Then we (Merlite Industries) designed a handy—*yet amazingly effective*—fire extinguisher to contain and release this new wonder-chemical.

So Easy to Handle!

In comparing the effectiveness of "C.B." in fighting various kinds of fires an authoritative testing laboratory's report states: "It has been proved that 'C.B.' is about 1.5 to 6 times as effective as other common extinguishing agents on an equal weight basis."

PRESTO contains "C.B." (Chlorobromomethane), the same chemical the U. S. Air Force specifies for fire-fighting in B-36s, B-29s and other U. S. aircraft. No wonder Presto puts out fires in as little as 2 seconds and is called Science's "Midget Miracle."

This extra effectiveness of "C.B." means that *Presto* can be made light and handy enough for even a woman or child to use. Just a twist of the knob . . . and flames disappear! "Sells on sight" to Civil Defense workers, owners of homes, cars, stores, farms, service stations, boats, motorcycles, factories, offices . . . and to stores for re-sale.

Why Large Presto Profits Are So Easy

Everyone is terrified at the very *thought of FIRE! Every year* fire kills more than 11,000 people — destroys over SEVEN HUNDRED MILLION DOLLARS in property. Millions of people have been waiting for this sure, simple, inexpensive safeguard.

Most people who see *Presto* in action want one or more—ESPECIALLY WHEN THE PRICE IS ONLY $3.98 EACH! We give you dramatically powerful printed sales material to "talk from" . . . free certificates testifying that *Presto* is GUARANTEED FOR 20 YEARS!

Advertised in National Magazines

YOU DON'T NEED TO INVEST A CENT! Just collect and *keep* $1 or more every time you write an order—we collect balance and make delivery. (Or you can buy from us at extra-low wholesale prices and make up to $2.18 per unit—we'll send you details.)

Get Started Now . MAIL COUPON

Get started in this rich new field now. Don't put it off. Every day you hesitate may cost you $10, $15, or even $50 you could otherwise be making. Mail coupon NOW for everything you need to get started right away!

MERLITE INDUSTRIES
Dept. 111, 114 E. 32nd St.
New York 16, N. Y.

Science's New "Midget Miracle" Over Two Million Already Sold!

Folks Are Amazed When You Tell Them This New Kind of Protection Costs Only $3.98

MERLITE INDUSTRIES, Dept. 111,
114 East 32nd St., New York 16, N. Y.

Please send me illustrated sales literature, liberal profit plan, order blanks—everything I need to start making good money introducing **Presto** in my locality.

☐ **Check here if you wish to order a regular Presto to be used as a demonstrator ($2.50).**

☐ **Check here if you wish to order a double capacity Presto to be used as a demonstrator ($3.75).**

Pay for themselves many times in increased sales. Can be returned as often as necessary for FREE refills. Send no money—we'll mail C.O.D. (Or enclose check or M.O. and WE will pay postage. Money back, if not delighted.)

Name . . . . . .

Address . . . . . .

City . . . . . Zone No. (if any) . . . . State . . . . . .

IN CANADA: Mopa Co., Ltd., 371 Dowd St., Montreal 1, P. Q.

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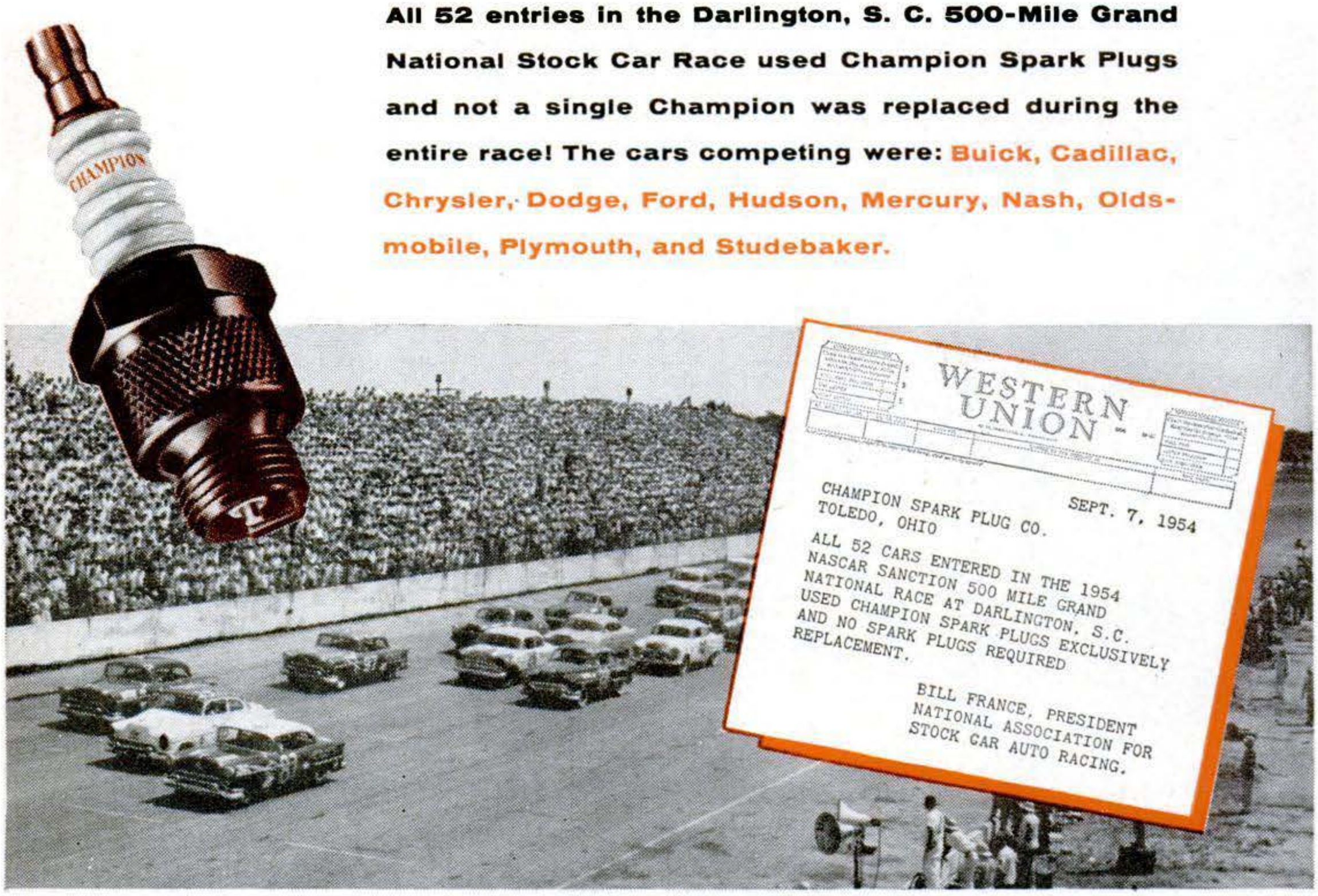
11 makes of passenger cars set Champion SPARK PLUG performance record!

All 52 entries in the Darlington, S. C. 500-Mile Grand National Stock Car Race used Champion Spark Plugs and not a single Champion was replaced during the entire race! The cars competing were: Buick, Cadillac, Chrysler, Dodge, Ford, Hudson, Mercury, Nash, Oldsmobile, Plymouth, and Studebaker.



Big-time stock car racing is a brutal test of spark plugs . . . they must stand up and deliver under punishment equal to many thousands of miles of normal driving. Only the best spark plugs can meet this challenge.

That's why professional drivers turn to Champions regardless of the make of car when the chips are down and performance is the payoff!

You, too, certainly want top performance from your car. But you won't get it with weak, inefficient spark plugs. Give your engine a fair chance to show what it can do. Have your Champion dealer install full-firing, five-rib Champions—the perfect partners for today's modern gasoline. You'll feel the difference immediately!

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

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POPULAR SCIENCE
REG. U. S. PAT. OFF. Monthly

Lumberjacks Race Bugs in Frozen Forest

1 **SOMEBODY HAS TO SHOVEL,** sometimes as deep as 12 feet, before a man with a power saw can get at the base of a big tree.

2 **A CLOSE SHAVE** cuts down waste in lumbering. Wintertime loggers who didn't shovel first often left stumps six feet tall.

Power chain saws fairly smoke in icy Idaho woods as cutters beat beetles to spruce trees.

By Bob Forbes

IN THE mountains of northern Idaho, where the snows can pile up 175 inches deep and "cat" engines sometimes have to run day and night to keep from freezing, lumberjacks these wintry days are tossing logs around as if they were too

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hot to handle. They are fighting a war.

They are in an all-out push to beat the spruce-bark beetle to 1,500,000,000 board feet of valuable house-building timber. The beetle's grubs have already infested that mighty stand of spruce, but they can be beaten if the dead and dying trees are not allowed to stand too long after being attacked. If a spruce stands dead in the forest for more than three years, its wood is no longer of any value to would-be home builders.

Furthermore, once infected logs have been tumbled into icy ponds and lakes, the beetle grubs are drowned. That means there will be a lot fewer insects to hatch and fly to infest fresh trees next May and June.

That's why the boys at Camp 44 of Potlatch Forests, south of Avery, Idaho, are "hot" logging again this winter, as you see them doing in the accompanying photographs. They and scores of other lumberjacks all through those tall, steeply sloped woods are cutting, skidding, sawing and hauling timber as fast as power chain saws, tractors, bulldozers and short cuts in technique will allow.

Fast logging of spruce is better beetle control than the most potent bug-killing chemical ever developed, seasoned lumbermen say.

The Living Is Far from Easy

With all the mechanical aids, it's still a grim, hard job.

"Working conditions here in the dead of winter are sometimes terrible," says Ray Bonner, camp-equipment foreman. "When a mechanic is outdoors, his tools may get colder than ice and stick to his hands."

In late spring, flying beetles fill the forests. "It's like being in a swarm of stingless mosquitoes."

Despite such hell and high snows, Camp 44 alone has got out of the mountains an average of 4,500,000 board feet of timber a month since its lumberjacks moved in on the infested spruce, two Decembers ago. Converted into lumber, that's enough wood each month to build about 400 two-bedroom frame houses.

3 ONCE A TREE IS DOWN, a "riggin' slinger" loops a choker cable around the trunk, so that it can be dragged. This is one of the few hand jobs left in logging and can be mighty cold.

5 LIMBING TREES TAKES LESS TIME with a power chain saw than it used to with ax or crosscut. A crew of men shears branches off a whole field of felled trees in a landing at one time.

7 AT A TRANSFER POINT, a loader on rails shifts logs from a truck to a flatcar. At this "hot" pace, logs reach sawmills and become lumber in a few days, whereas it once took weeks.

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4 HITCHING A "CAT" TO A TREE is the next step. It is then skidded, branches and all, to a landing, or concentration point, in the forest. This is the initial short cut in "hot" logging.

6 ABOUT 10,000 BOARD FEET of logs, sawed into 32-foot lengths, start for a transfer point a couple of thousand feet lower in the mountains. Keeping access roads open is a steady chore.

8 GREASE JOBS IN A HURRY are provided right beside the logging road in a temporary service station. Lubricating the trucks and changing their 30 quarts of oil takes but 12 to 15 minutes.

9 THE SNOW HAD MELTED to this height last February. A month earlier there had been twice as much. Lumberjacks wear hard hats to protect themselves from falling limbs. END

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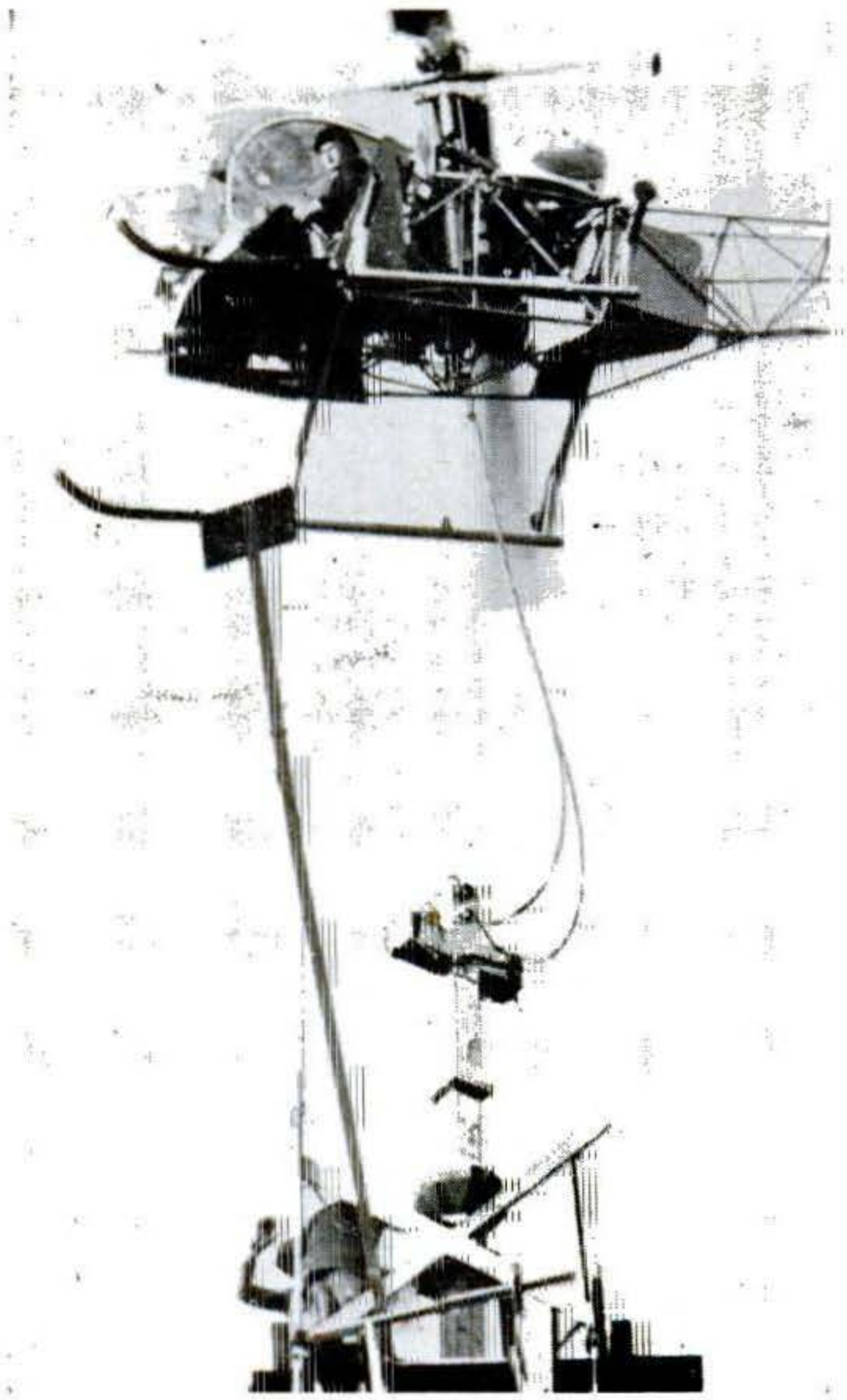
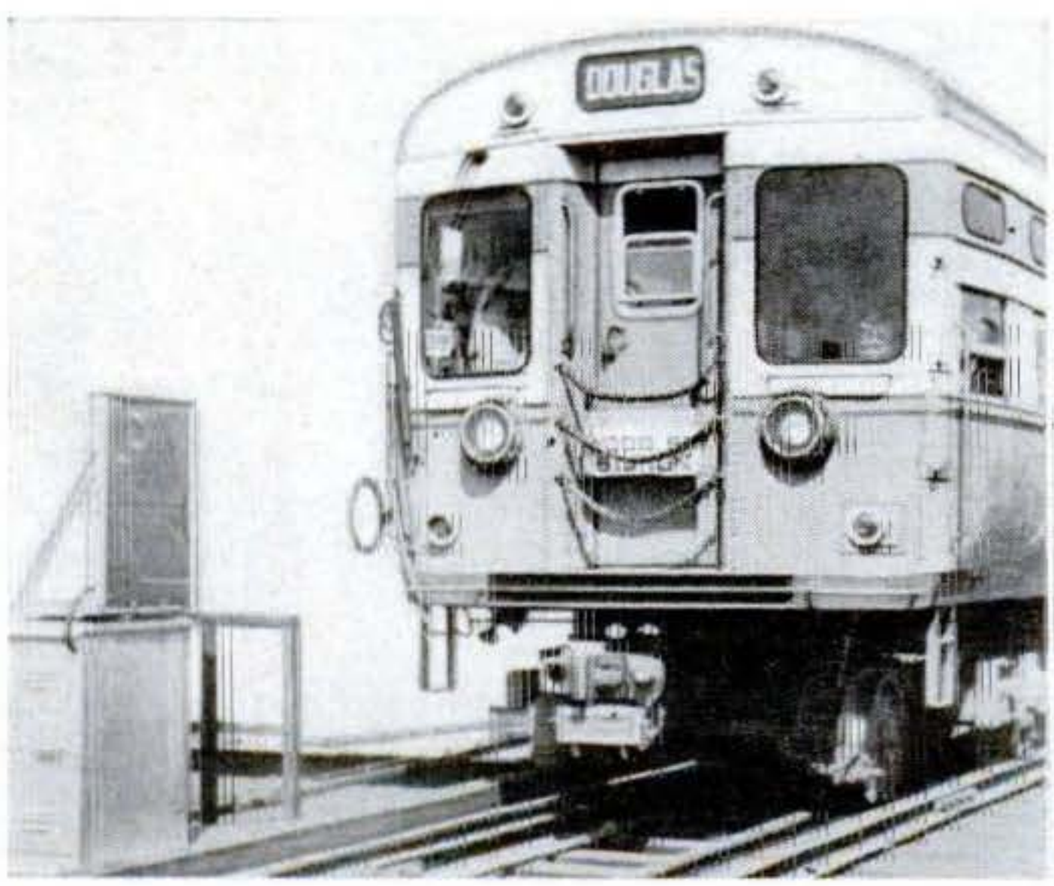
Clip on Nose Aids Escape from Sub

AN ESCAPE hatch will get a sailor out of a disabled submarine easily enough, but surfacing safely is another matter. Several new methods and devices for the job were demonstrated recently by the British Navy at HMS Dolphin, a submarine shore station at Gosport, England.

Among them was a simple nose clip. It is shown being worn by the kneeling sailor in the first photo at right. Before leaving the escape hatch, he breathes a special gas mixture from the tube being used by the other sailor, who is wearing an uninflated immersion suit. Then, up he goes through the water (center) and whooshes to the surface. Although an immersion suit was worn for the demonstration, a trapped crew could surface wearing only nose clips.





Radio Switches Transit Trains

WHEN a Douglas Park train of Chicago's rapid-transit system passes a trackside receiver-transmitter (photo above), a doughnut-shaped tuning coil on the lead car sends it a message. This automatically sets switches and signals ahead.

Copter Does Steeple Jack's Job

THE people of Avesta, Sweden, had a new church and steeple. The problem was how to install a 300-pound, 15-foot-high cross on top. The solution was a helicopter, shown at left hovering steadily as it lowers the cross to workmen on a scaffold.

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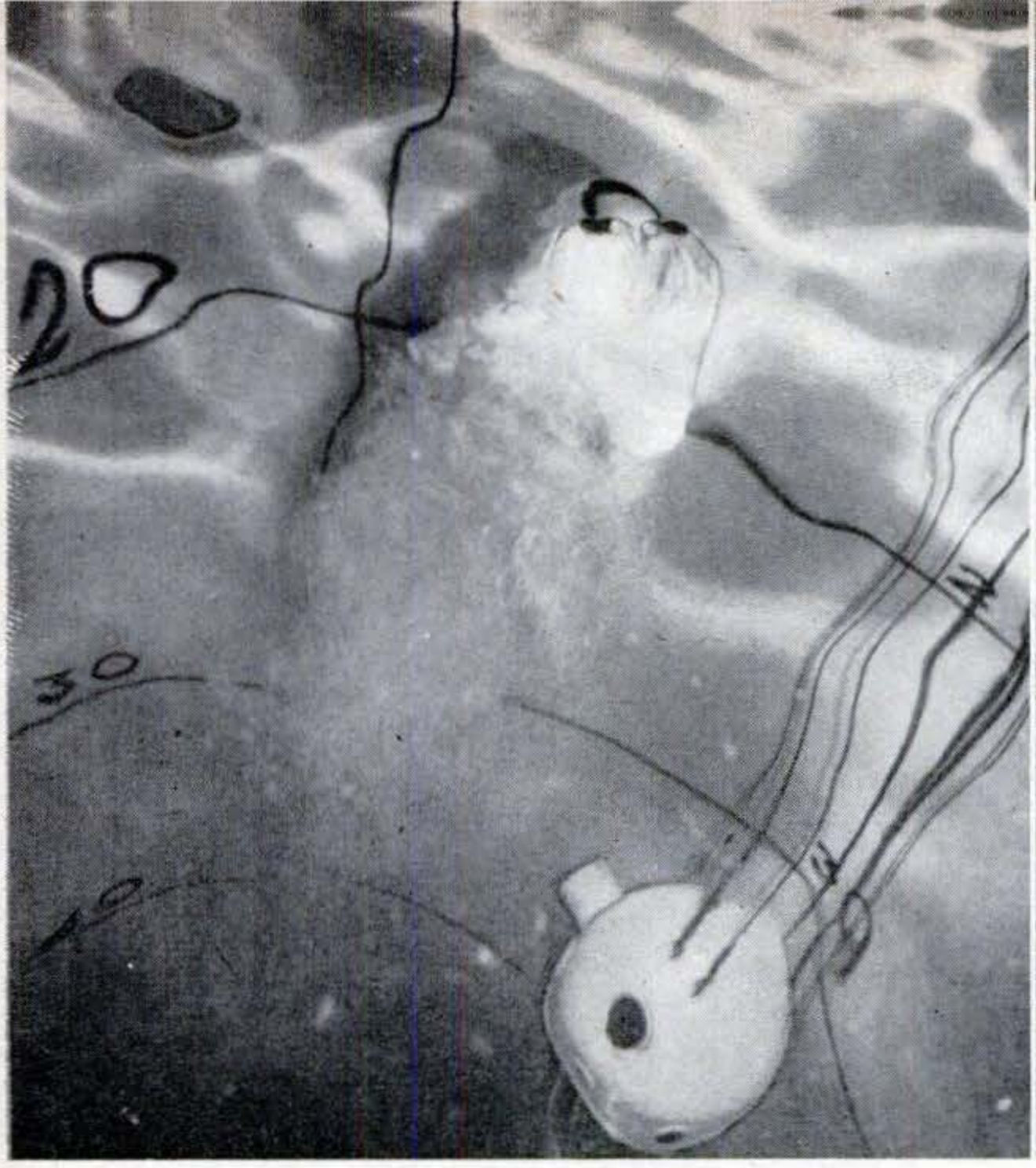

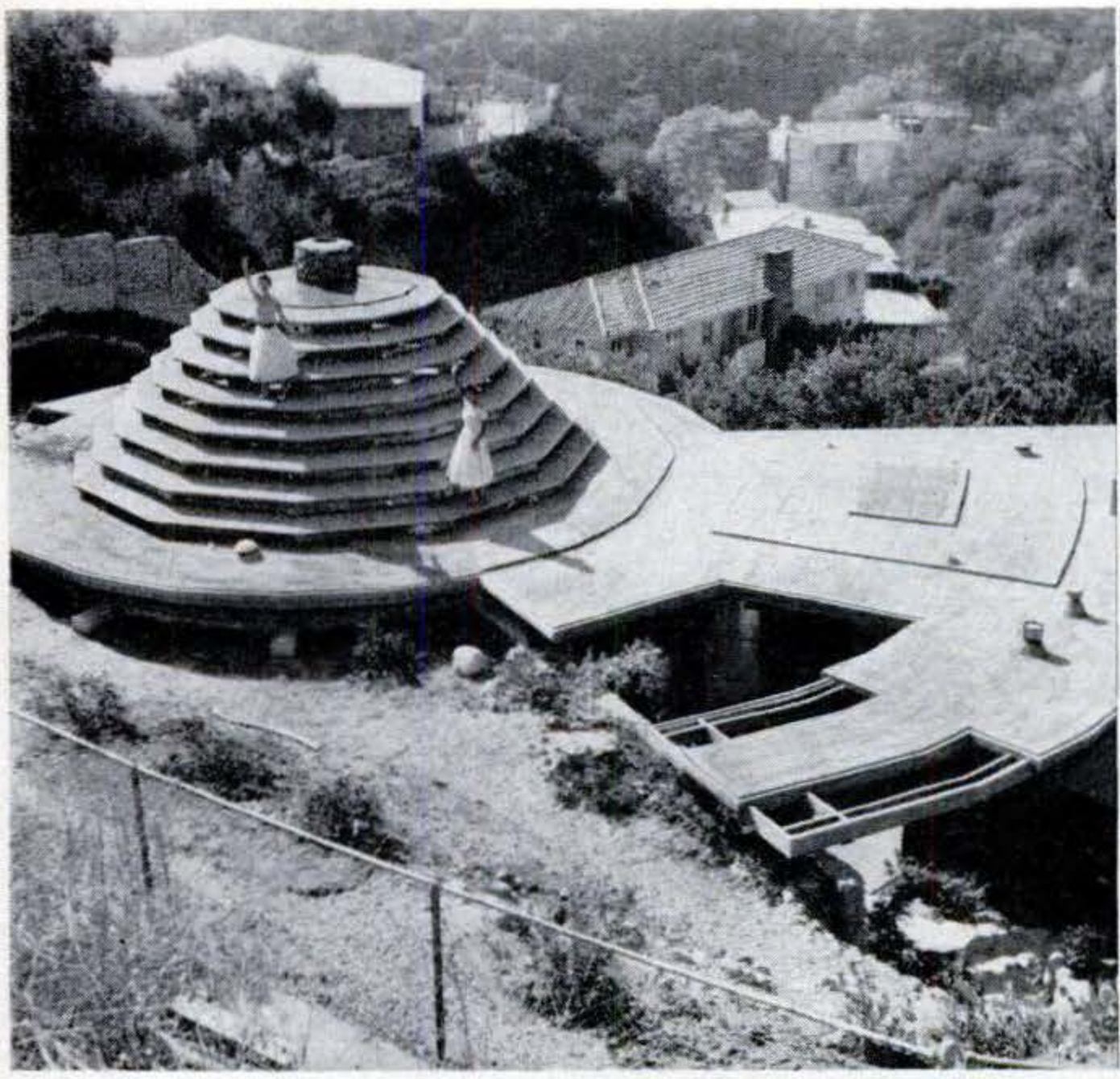

Beehive House Creates Buzz Even Among Hollywood Homeowners

THE steps the girls above are standing on form the domed roof of a novel redwood-and-concrete house perched high in the hills of Hollywood. Between the steps are glass-riser windows. Running down through the center of the beehive roof is the oversize chimney (above right) for a round, free-standing rock fireplace that is the hub of the home. From this fireplace radiates not only heat but accordionlike partitions that divide the various living areas into pie-wedge shapes.

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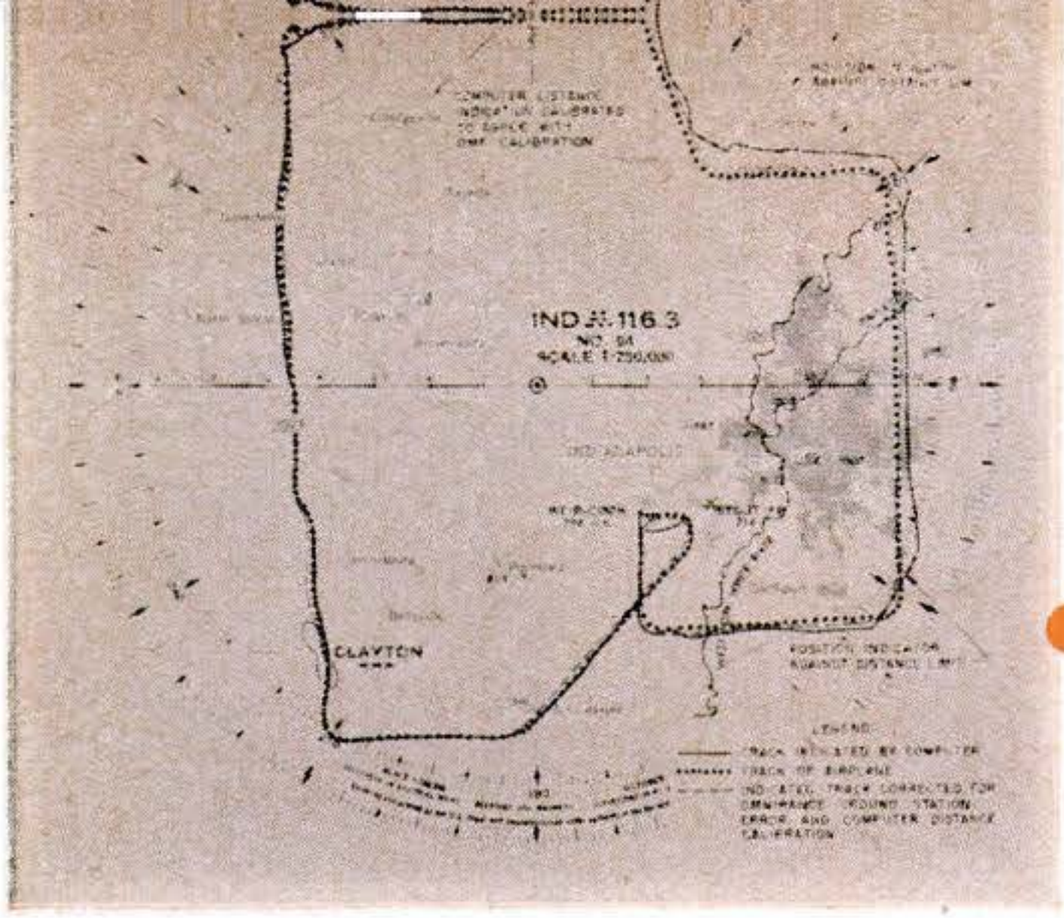


PICTORIAL COMPUTER, developed by CAA, shows the pilot his position at all times. A tiny indicator over the map in cockpit viewer (right) shows pilot where he is, while automatically penning in line to show where plane has been. To navigate, the pilot simply "flies" the indicator in the direction he wants the plane to go. On the map at left, solid line is track drawn by the instrument in flight. Dotted line, put in later, shows actual course flown by plane. Error made by the computer is slight.

By George H. Waltz Jr.

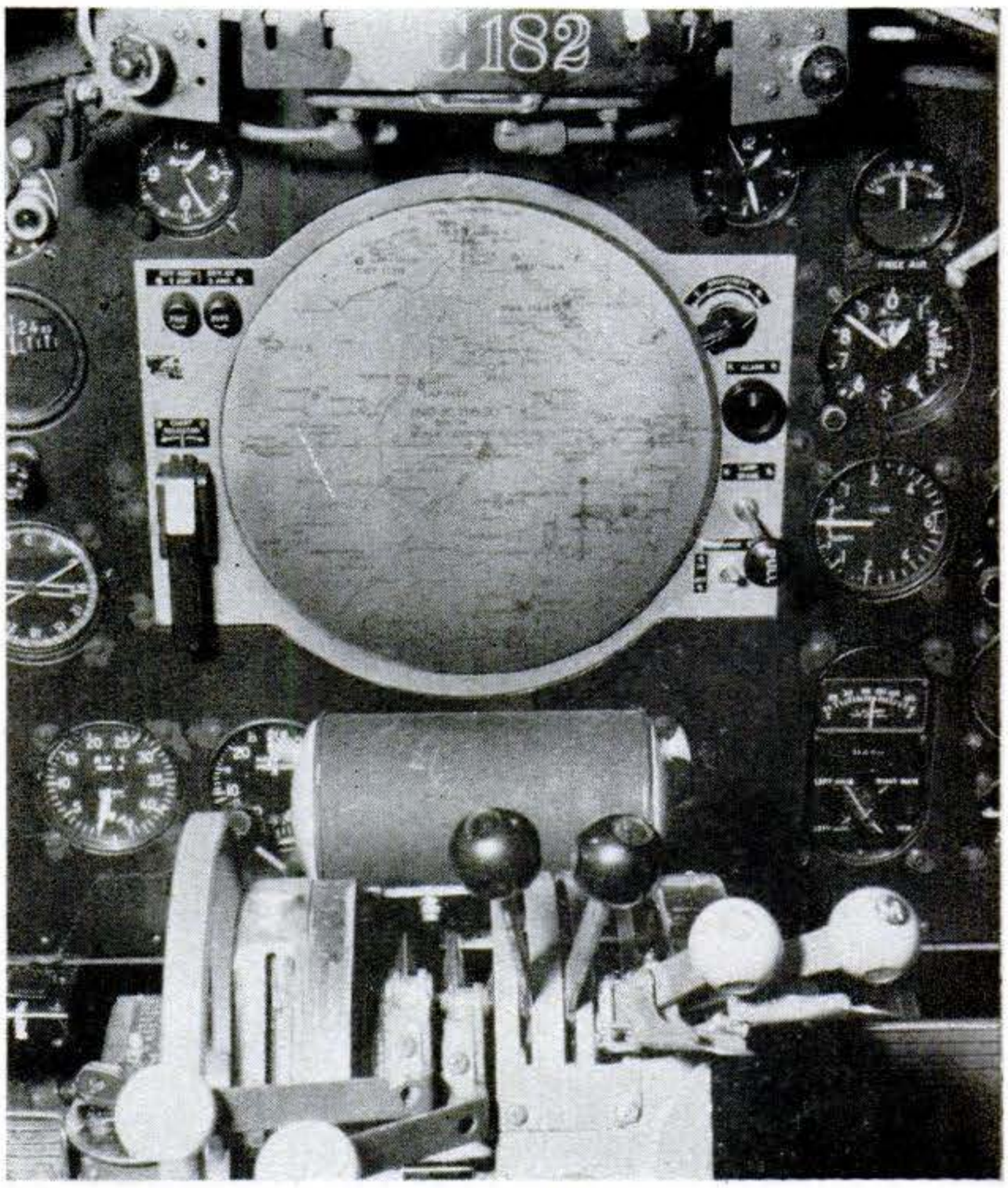
The Amazing Machines That Simplify Flying

Robots take on cockpit chores, freeing airline pilots to think ahead and handle emergencies.

TWICE a week now, a Scandinavian Airlines DC-6 refuels at Winnipeg, Canada, and heads for the "top of the world" with passengers and mail from Los Angeles. It is bound for Copenhagen, Denmark.

Towns and roads soon vanish and the plane roars on over a wilderness of forests and lakes The pilot reaches out and turns a little black switch on the instrument panel. A gadget no larger than a baseball then takes over his job. It will navigate and pilot the big, four-engine plane through a region where ordinary compasses swing crazily and conventional methods of navigation become complicated and next to useless because of the closeness of the North Magnetic Pole.

The baseball-size gadget is a precision gyroscope, the supersensitive spinning heart of a new air-navigation system



SIMILAR PRINCIPLE as pictorial computer's works this instrument Here a tiny plane silhouette moves over projection of map on ground-glass screen, showing pilot his position.

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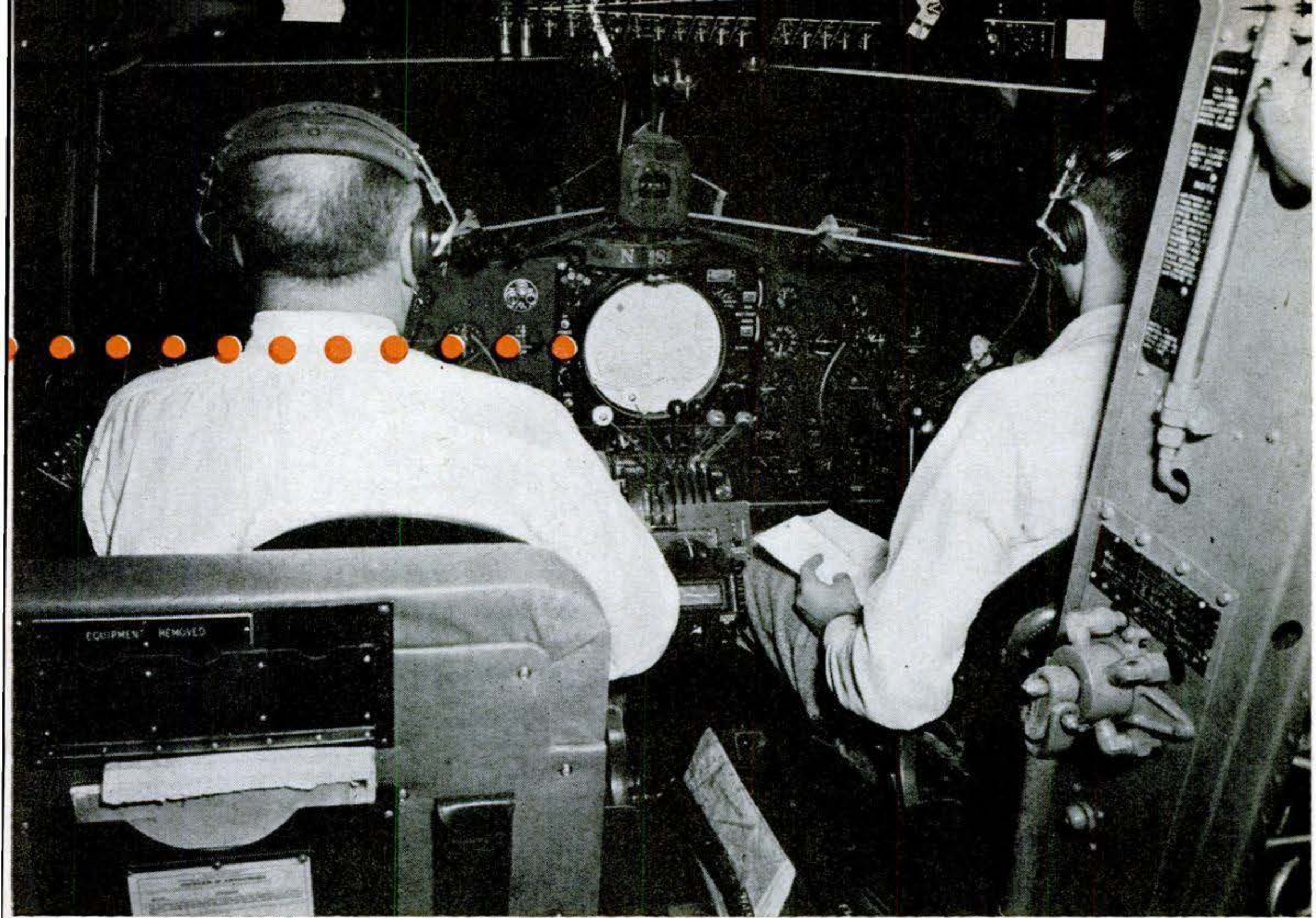

called Polar Path Control. Once set to a great-circle route, the Polar Path system, guided by the spinning gyroscope which opposes any change, sends electrical signals to the plane's automatic pilot. While the DC-6 flies the great-circle route, the human pilot and navigator simply monitor the system.

Ultimate Goal: Push-Button Flight

Scandinavian Airlines' Polar Path system, developed by Bendix Aviation's Eclipse-Pioneer Division, dramatically illustrates a trend toward "push-button" flight. All the leading manufacturers of airplane instruments and controls, and the nation's major aeronautical-development centers, are now working toward that goal.

Airplanes have been flown in the past the way you drive a car, from the inside looking out. But there is a tendency now toward flying planes the way a boy runs his electric trains, from the outside looking in.

Among other push-button devices that are emerging from our flight laboratories is a "pictorial computer"—a sort of animated aerial road map that shows a pilot where he is at all times.

Completely automatic, the device in its simplest form consists of a large, round glass-windowed indicator mounted in the plane's instrument panel. When a disk-shaped map showing the terrain over which the plane is flying is put into place behind the window and the instrument is turned on, a penlike indicator starts to move across the map, pinpointing the plane's actual position and drawing in a line showing where the plane has been.

To fly his plane from one point to another regardless of the weather, the pilot simply "flies" the indicator across the map, changing the plane's course to make the indicator follow the desired course. He need take no radio bearings, consult no charts, watch no compass. He can direct all his attention to supervising the general pattern of his flight.

The pictorial computer is operated by

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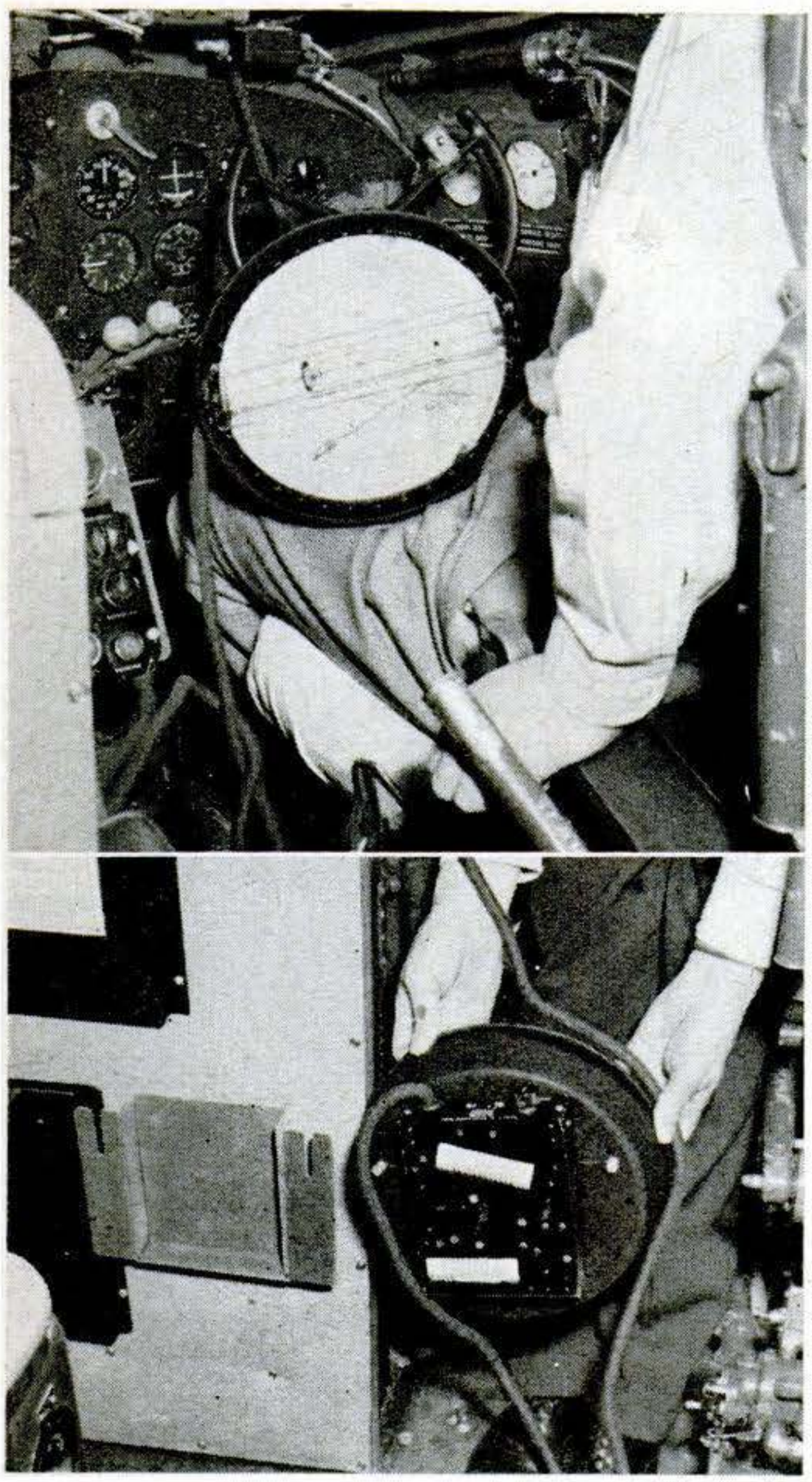
Midget computer figures position from pilot's lap



PORTABLE NAVIGATION ROBOT, small enough to ride in pilot's lap, fits into special rack (shown in lower photo) when not in use. Like big brothers, its job is to pinpoint position.

two radio signals sent out by stations on the ground. One signal gives the bearing; the other, the plane's distance from the station. Both signals are available to pilots now, but the pictorial computer interprets and combines them in a way that is easy for the pilot to follow.

By relieving the pilot of unnecessary duties, the pictorial computer, developed by the Civil Aeronautics Administration's Technical Development and Evaluation Center at Indianapolis and built by the Sperry Gyroscope Company, goes a long way toward solving many of the problems plaguing airmen.

If all planes were equipped with such computers, they could be navigated safely through all the available air space, not just over the radio-beamed airways. Most flights could be direct, rather than zigzagged as they now are. The traffic problems at airports would be reduced, since each plane could be assigned any one of a number of separate landing channels indicated on the computer's map.

Planes could then approach the airport safely from all angles instead of being funneled down a single path. And since each pilot would always know exactly where he was with relation to the airport, more planes could be "stacked up" for instrument approaches during bad weather.

Instrument Men Try for Simplicity

This navigation computer is only one of many so-called pictorial instruments that are being developed. The instrument makers' aim is to replace the dials and gauges that now form a maze of ever-moving needles on a plane's instrument panels with simple, easy-to-read instruments that give such a good picture of what is happening that even a non-flyer would be able to read them.

Already in the works are pictorial flight instruments and a pictorial indicator that will show a pilot at a glance just how his plane's engines are operating. They are part of the trend toward giving the pilot of tomorrow the flight information that he needs, not as readings that he has to interpret but as visual pictures that he can understand and use with a minimum of effort and time.

But how about completely automatic flight? How long will it be before you can fly from coast to coast in planes that are guided automatically from take-off to landing?

This may happen sooner than you think. Already, transport planes are being fitted with versatile automatic pilots that not only provide for automatic flight control from point to point but also for automatic landing approaches. By the time you read this, you may have flown in a

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plane with this new equipment without knowing it.

As an airplane nears an airport, the new device automatically heads it into the "localizer path" of the conventional instrument-landing system, then guides it into the "glide slope," controls the throttles to maintain proper air speed, and brings the plane in over the center of the runway. Only at the last moment, just before the wheels touch down, must the human pilot take over.

Robot Takes Command

Another system was announced recently by the Minneapolis-Honeywell Regulator Company and the Air Research and Development Command of the Air Force: a completely automatic device that enables an airplane to take off, fly a course to a given destination, and then land—all without one bit of help from a human pilot!

This Automatic Master Sequence Selector (AMSS) is an intricate electrical brain whose "memory" is a punched paper tape resembling a music roll for a player piano. All the information for a flight is recorded, step by step, as a series of holes punched in paper tape.

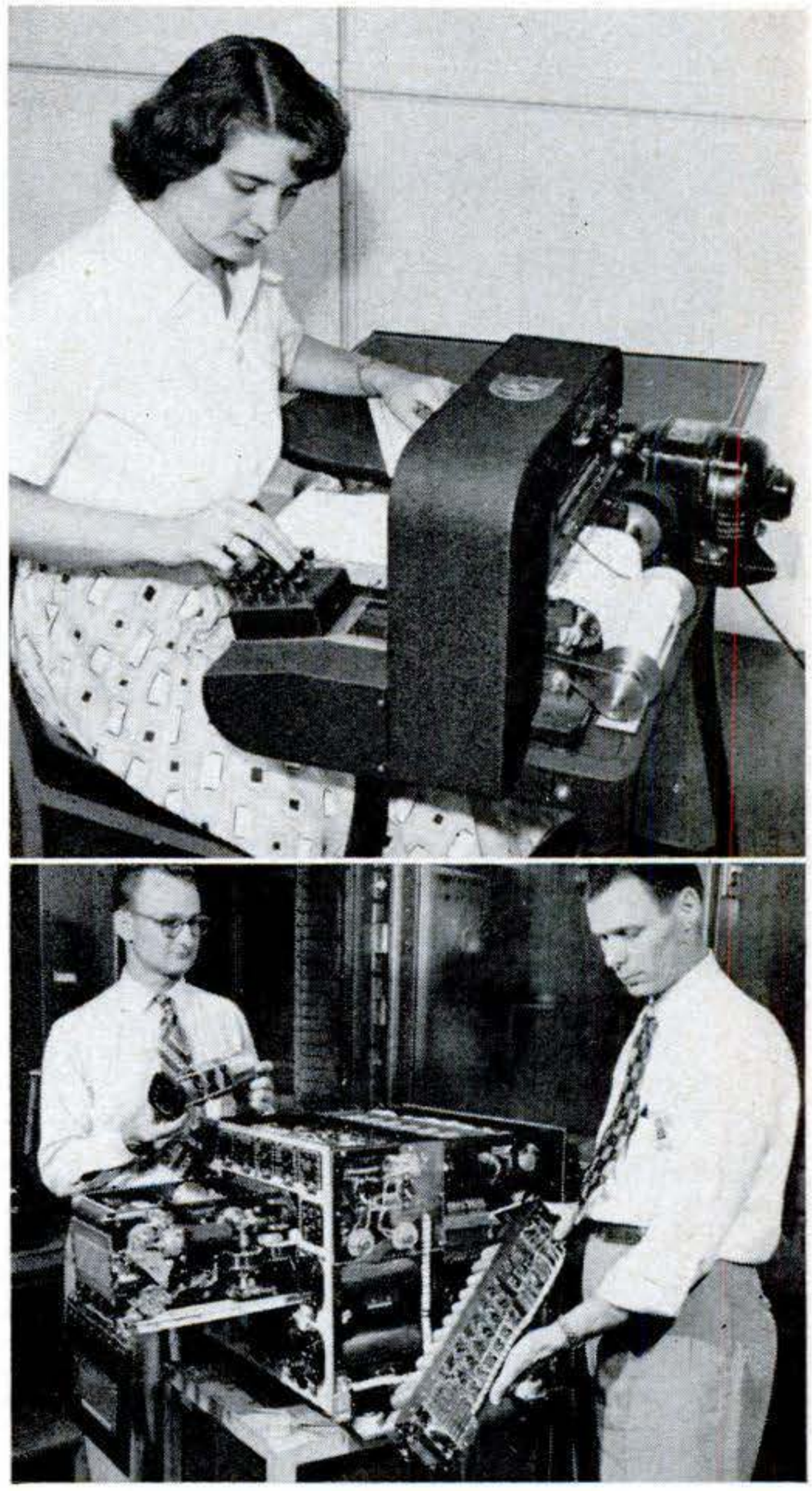
When the tape is run through the electrical brain in the airplane, 430 tiny metal fingers, like the fingers of a blind person reading Braille, search out the holes. Where there are holes, the pins make electrical contacts which produce electrical signals that operate the plane's automatic pilot, a special navigation computer, a throttle controller, the landing gear and flaps, and similar controls.

AMSS Is Johnny-on-the-Spot

Under the guidance of AMSS, the plane thus will take off, raise its landing gear, climb to a given altitude, level off, fly given courses, change altitude where necessary, arrive over its destination precisely on schedule (speed is varied, if necessary, along the way to maintain the schedule), lower its landing gear, land, and brake to a stop.

All this is done without human aid. Yet the device is so designed that the

Player-piano flying takes pilot along for the ride



COMPLETE FLIGHT PLAN is punched out on paper tape (top photo). Inserted in a drawer of the electronic brain above, the tape flies the plane from take-off to destination.

human pilot can keep tabs on the flight's over-all progress at all times. If an emergency arises, he can assume manual control instantly.

But why all this desire for automatic flying? What's wrong with a human pilot? Why spend huge sums of money for push-button equipment when you need a skilled pilot to stand by anyway?

The answer is twofold. First, say the aviation experts, the increasing complexity of modern airplanes and the ever greater speeds at which they fly place more and more responsibility on plane

[*Continued on page 256*]

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Space Cadet's Playhouse Is A Rocket Ship

TEN-YEAR-OLD Jimmy Maxwell is both pilot and captain of this 15-foot spaceship, Lunar Bell. Although it is anchored in the garden of his home in Sheffield, England, small-boy imagination takes him on thrilling interplanetary flights. His father, who built the novel playhouse of wood, cardboard and balloon fabric, plans to add electric light and a motor for realistic effects.

▶▶▶Wildlife meets the jet age: In England recently an owl stowed away on a jet plane and made four flights to 25,000 feet before being discovered, a bit seedy from lack of oxygen. In New York, a doe and a fawn were less lucky. They were both killed while crossing a runway as a jet fighter was coming in for a landing.

Science Probes the Camel

THE calm camel at right is getting a metabolism test at a portable laboratory in the Sahara Desert, part of a scientific study to discover how camels withstand the heat of the desert. One fact brought to light is that they do not have special compartments for storing water.

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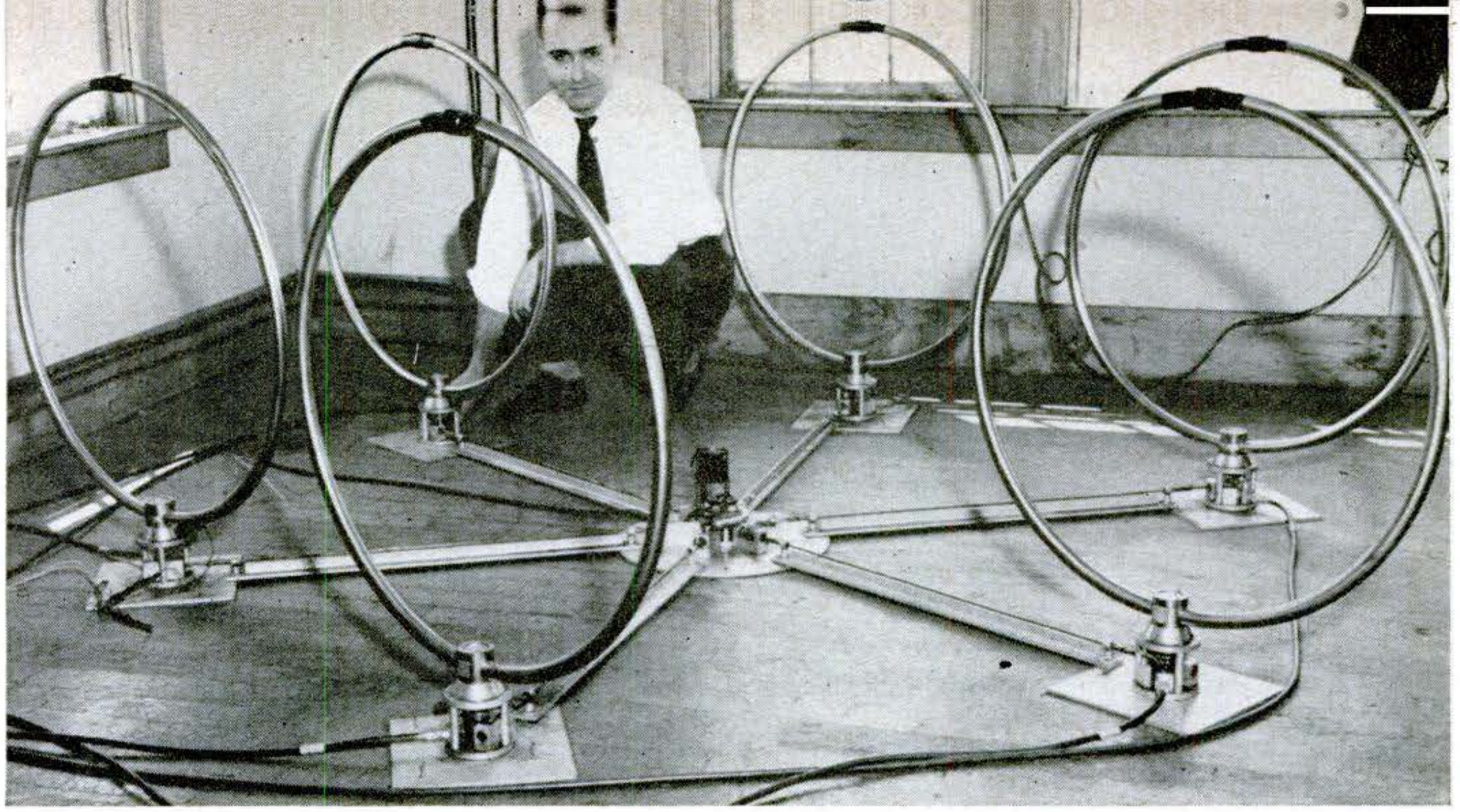
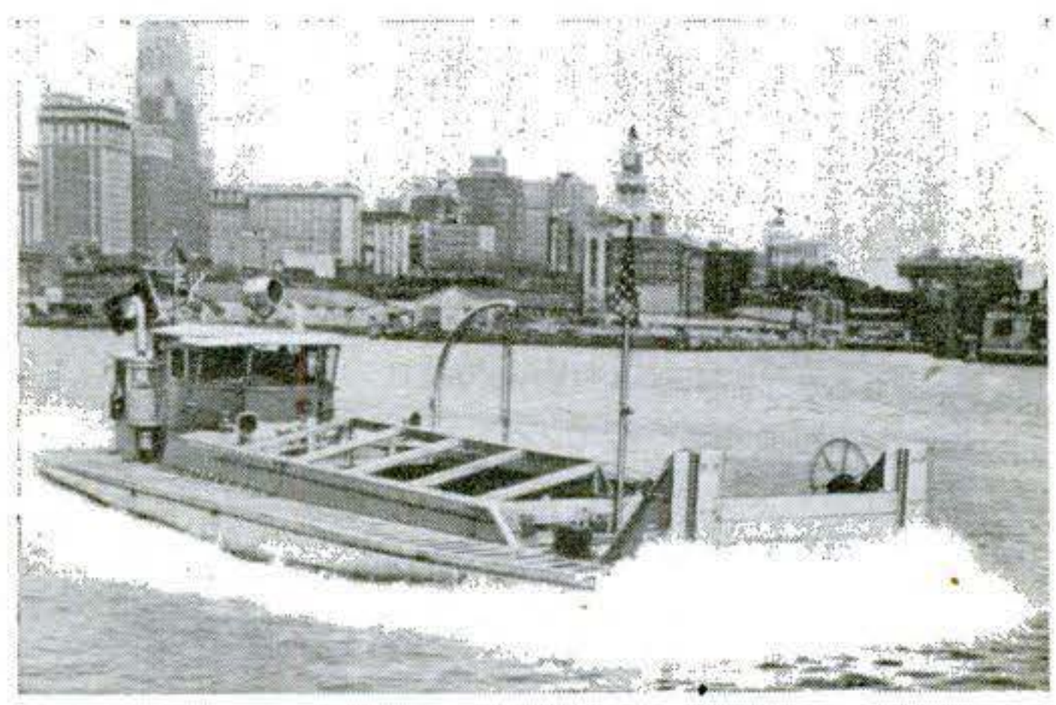


Spinning Loops Tune in Static for Air Force Research

THE Air Force bends an ear to static 24 hours a day in a beach cottage at Scituate, Mass. Every 15 minutes, synchronized loop antennas on the floor of one room (above) rotate to pick up any snap, crackle or pop in the air. The recorded data will help scientists establish reliable radio communications regardless of atmospheric noise.

Popcorn Popped in the Package

Now you can pop corn without a popper. The hard kernels come packed in a foil pan that you set right over a stove burner or flame (left). The folded-back lid forms a handle and when you hear the first pop, you shake the pan over the heat until the tucked-in foil puffs up like a balloon. Top-Pop Products Co., 25540 Grand River Ave., Detroit, makes E-Z Pop.



Army Gets Biggest Plastic Boat

THIS 10-ton, 51-foot plastic boat, biggest yet made, can carry half its weight in cargo or push a string of barges. It rides on 12 pontoons, powered by two 165-hp. diesels. Built for the Army by the Englander Co., it can be knocked down into 15 pieces.

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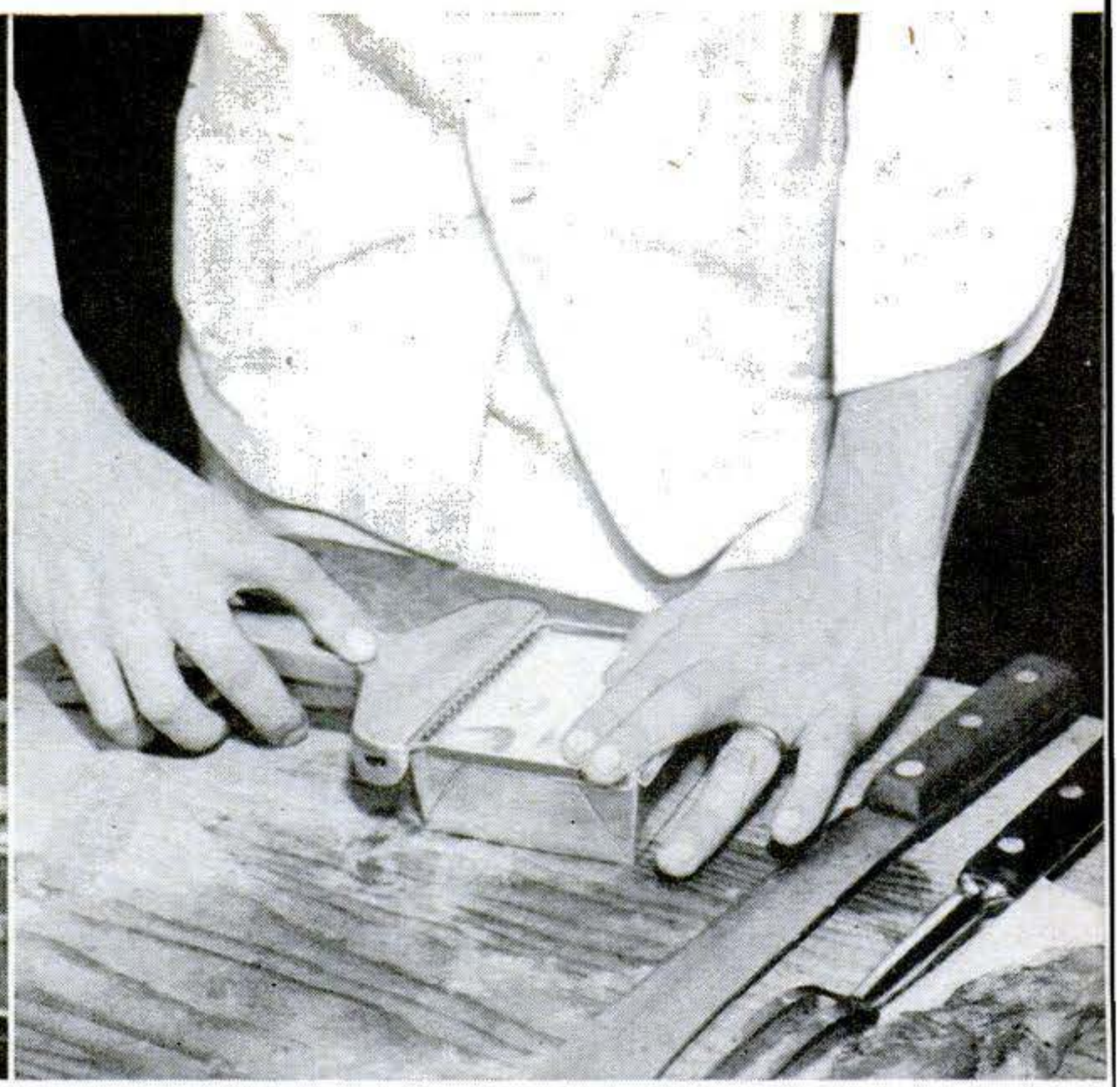
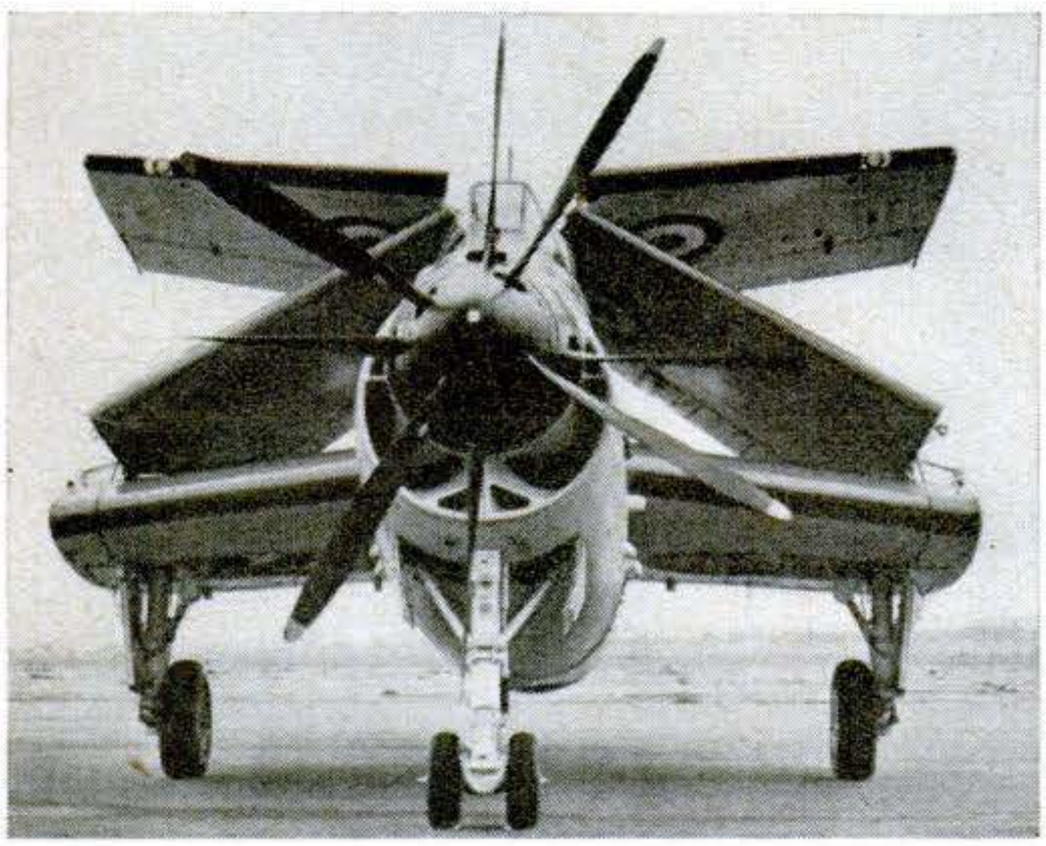


Fliers Turn Cooks on Long Radar Patrols

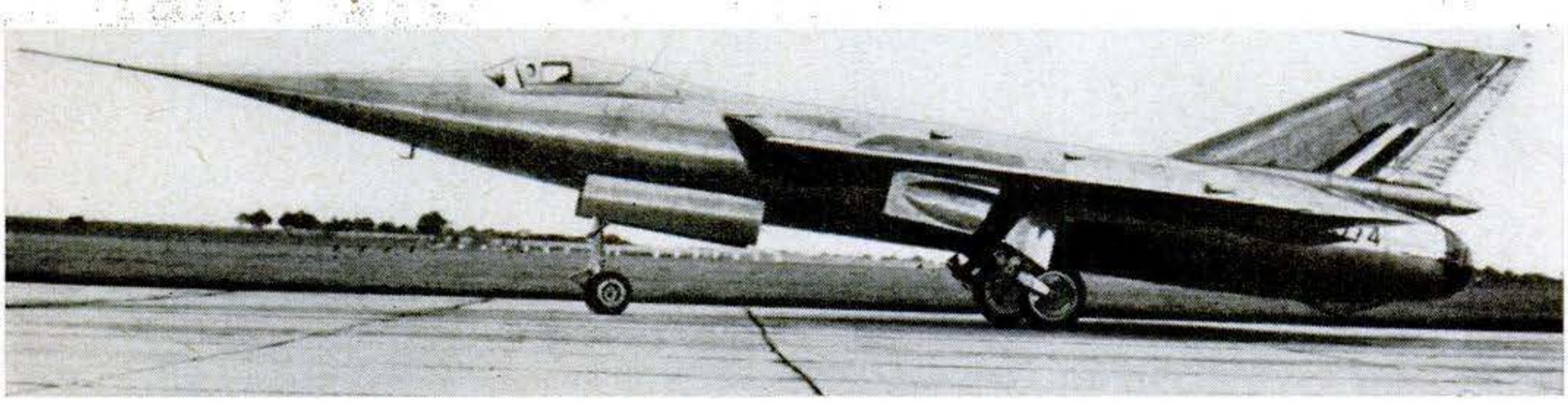
CREWMEN of radar picket planes who fly round-the-clock missions need more than box lunches at chow time. To eat hearty, each man becomes his own short-order cook,

Well-Hinged British Planes Show Folding Wings, Drooping Nose



THE designers out at Britain's Fairey airplane firm seem to be wild about hinges. One of their new jobs, the Gannet sub killer (left), has two sets of hinges in each wing so that the wing can fold twice instead of the usual once. Saves hangar space.

Another Fairey product, the supersonic research plane called Delta II (below), has a hinged nose. The whole length of needle-pointed front raises and lowers like a drawbridge—in flight. Lets the pilot see the ground during take-offs and landings. The dart-shaped Delta II has knife-like wings, so thin they barely house the retracted wheels.



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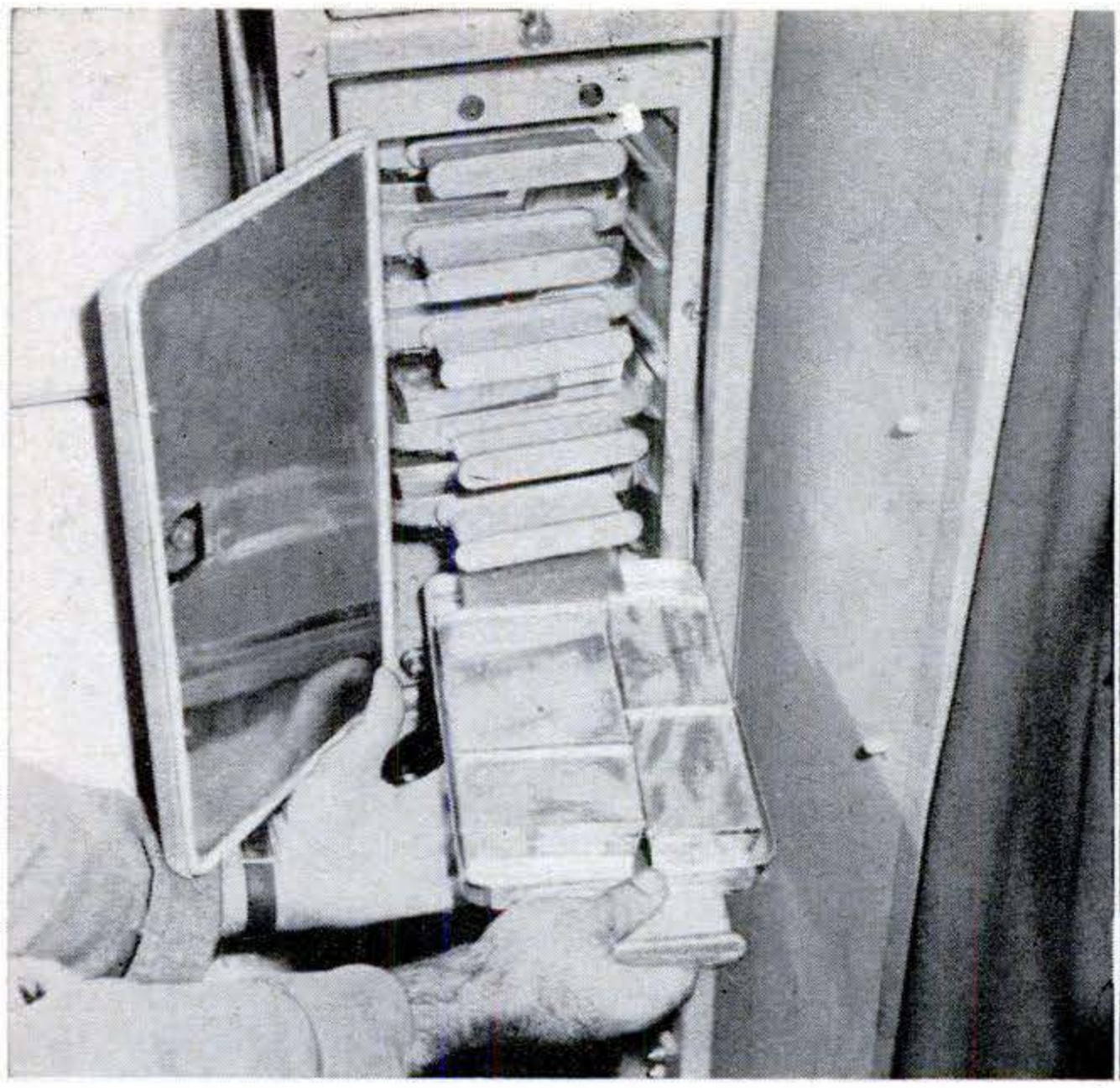
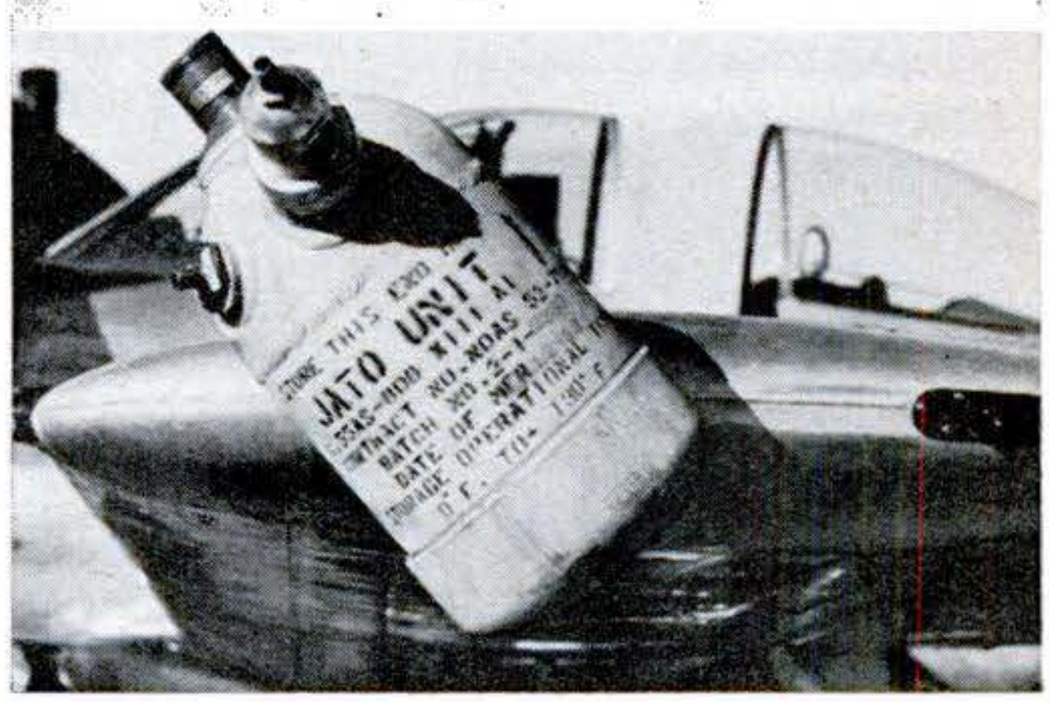


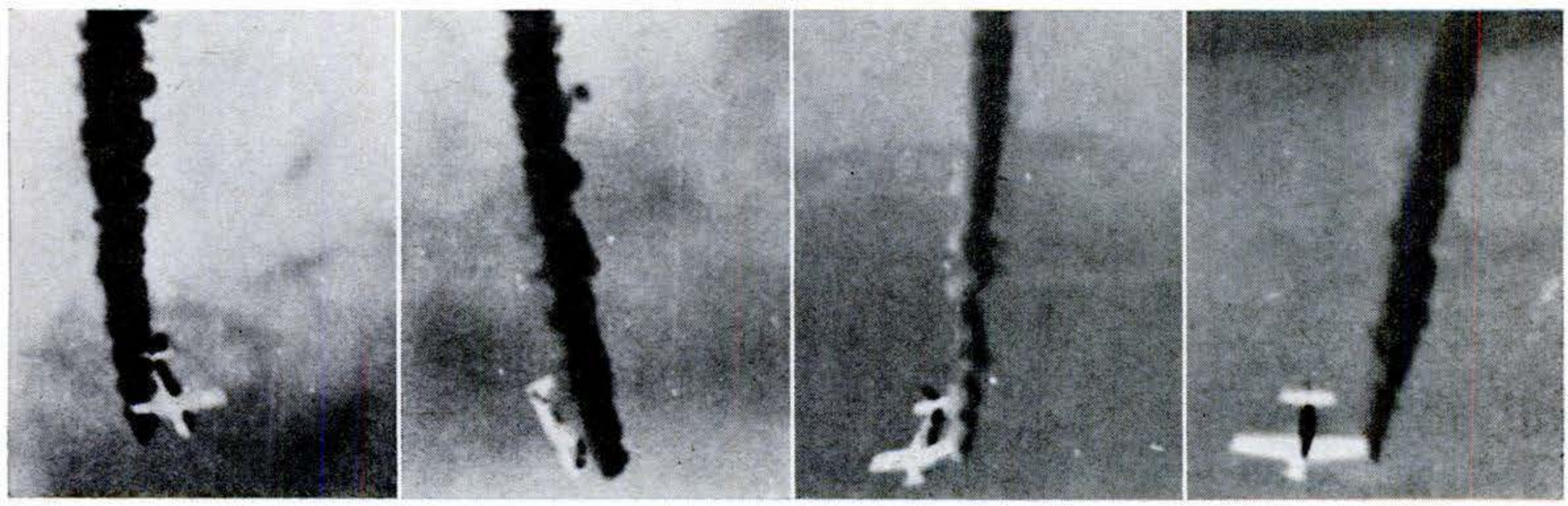
choosing from a supply of frozen foods partly cooked on the ground. Individual portions are packed in aluminum pans and stored in the plane's dry-ice refrigerator. A flier selects a meal and slides his tray into the oven (above left). A half hour later, he sits down to a full-course hot dinner. Yep, that's steak.

Small Jet Unit on Wing Stops Spin When the Test Pilot Can't

A TEST pilot can now use a small jet to blast a new plane out of a spin if it doesn't make a normal recovery. JATO (Jet Assisted Take-Off) bottles at the wing tips unleash brief but furious power in a direction opposite to the spin. With a bottle firing from the left wing (below), a right spin is stopped and the ship falls free until the nose lifts for a normal pull-out.

North American test men pulled out of 16 punishing spins over a two-year period to perfect the system.





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What the World Calendar Means to You

It's time to simplify

JANUARY · APRIL · JULY · OCTOBER

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

New Year's always comes on Sunday

July 4 falls on Wednesday, but that may be changed

Friday the 13th comes four times a year

April now hath 31 days

FEBRUARY · MAY · AUGUST · NOVEMBER

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Thanksgiving is Nov. 23, now and forever

Feb. 13 may become a new holiday in place of both Feb. 12 and Feb. 22

Memorial Day may wind up on May 27

February gets 30 days; May and August each lose one

MARCH · JUNE · SEPTEMBER · DECEMBER

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

W

Labor Day settles down on Sept. 4

This your birthday? You'll always celebrate on Wednesday

Christmas comes but once a year, always on Monday

Happy Worldsday! In Leap Year, there's another one at the end of June

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life! The world may adopt a

New Calendar in 1961

If everybody can agree on its dates, it may serve as one of several new tools to help nations work more closely together.

By Edward D. Fales Jr.

TAKE a good long look at your shiny new 1955 calendar! You may not see many more like it. The months may soon be streamlined.

Just six New Year's Days from now you may nail up a calendar that you'll never have to change (unless you tire of the picture). The dates will always stay the same.

By 1961, if a move now under way succeeds, you'll have what is called a "world calendar." Among other novelties, it will give you an extra holiday between Christmas and New Year's.

The world calendar is just one attack in a vast new drive for ***new tools to pull the world closer together.***

Our best brains are trying to comb out tangles and delays —and to give a jet assist to learning. The reason is simple, and deadly important. It's to keep us from being overwhelmed by our own progress!

Not only your calendars but your speech, spelling, reading and travel may be affected. And so, too, your food and drink. Already one big U. S. company has an "international recipe bureau" at work in Paris pumping foreign recipes into your wife's kitchen—and your wife's recipes into foreign kitchens.

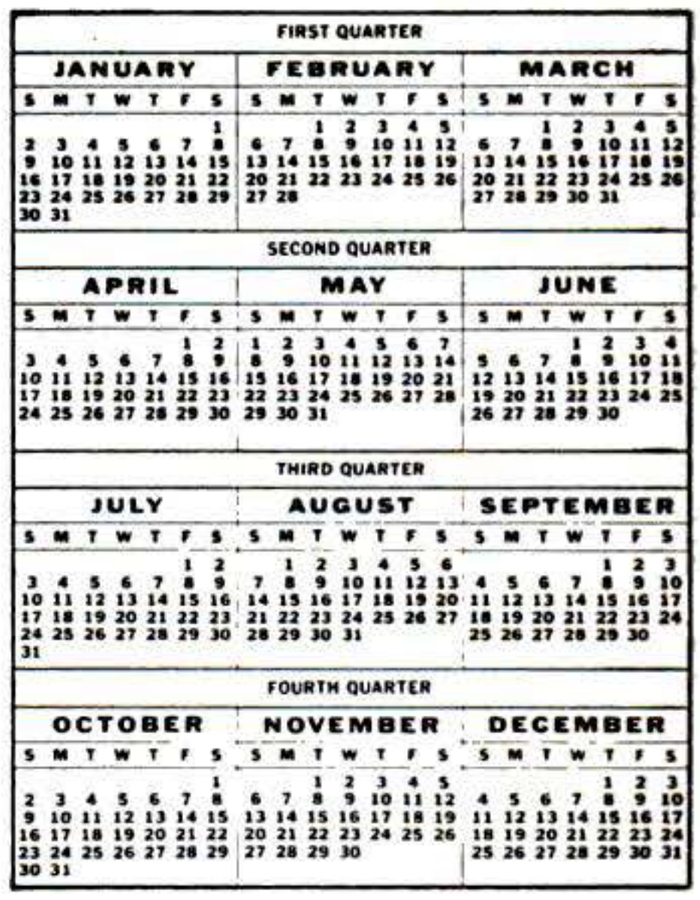
IT'S NATURAL that they've had a ground crew at work on the calendar. It has been limping along on only three jets for some time.

Remember the first rule you learned in math? "Halves are always equal!" Yet our calendar year, which is one of the tap roots of our whole measurement system, has halves like a lopsided hamburger. One is bigger than the other. From January to July is 181 days; but from July to January is 184.

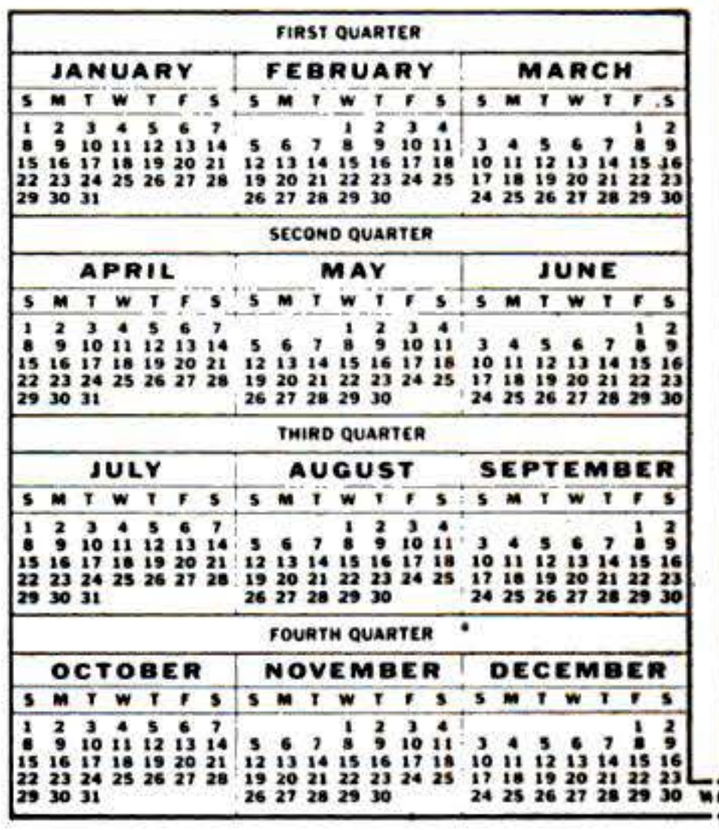
This world calendar, which would correct that fault, is a U. S. project backed by a lot of businessmen. But the idea caught on in India, which is cursed with several calendars,

How they differ

Your '55 calendar . . .



. . . would look like this



MORE LONG WEEKENDS are in prospect if the world calendar is adopted. Sponsors suggest that all holidays that do not fall on Monday on the new calendar, like May 30 and July 4, be celebrated then.

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and now India has put it up to the UN. The UN's Economic & Social Council has approved it—and now wants to know if Washington and 84 other capitals will buy the idea. If so . . .

- The year gets four shiny new quarters of 91 days.
- Your birthday and all other dates will *always* fall on the same day of the week.
- New Year's will always be Sunday, Christmas Monday.
- The Fourth of July will always come on Wednesday.

And for the first time, a Sunday will no longer follow Saturday! This will happen once a year. Dec. 31, which is the troublesome 365th day, will be wiped right off the calendar. And in its place will come a numberless day, "Worldsday." Since Dec. 30 will always be a Saturday, "Worldsday" will be tucked right in between Saturday and Sunday.

Once every four years there'll be another holiday—"World Leapyear Day"—tucked in between Saturday, June 30, and Sunday, July 1.

Back of these date changes are two headaches:

1. Our years are too long, by roughly a day and a quarter. Just try to divide 365¼ by anything! Calendar makers have a job like fitting a 1-inch bolt into a .99-inch hole. It can be done, but something has to give. And so—

2. We get "grasshopper days." Thanksgiving hops all over late November. Labor Day leapfrogs between Sept. 1 and 7.

"Timetable" mixups in business, schools, sales, paychecks, and world statistics will be eliminated by the inclusion of Worldsdays. But there's a bigger reason than that, claims the World Calendar Association of Rockefeller Center, New York, for such days. It's world friendship. They say that people who keep the same holidays feel more kindly toward each other.

It all depends on who's talking

When UN guide Kay Wenton (left) of New York says "pear" she nearly blows out the candle. When Anne de la Gabbe of Paris says it, the candle doesn't flicker. Differences in pronunciation hamper the development of a universal language.

IF CALENDARS can help pull the world together, so can *words.* In Calcutta not long ago an American made a speech on Freedom. But it didn't go over. To his listeners Freedom meant freedom from *desire.*

Today International Business Machines has a machine which may help out. You put in a message in Russian or French—and out it comes in good old U. S. English. You have to tag three bases:

1. The other day, the UNESCO *Courier* reported, someone put in a French message that said:

"Il n'est pas étonnant de constater que les hormones de croissance agissent sur certain especs . . ."

2. The machine spouted out this in type:

"Not is not astonish of establish that/which? hormones of growth act on certain species . . ."

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3. Then a typist (who didn't know French) polished it up: ***"It is not surprising to learn that growth hormones may act on certain species . . ."***

But of course you aren't going to haul along an IBM machine to talk for you on your next canoe trip up the Amazon. So what then?

Esperanto won't help unless you find some scholarly natives. Nor will Interlingua. These "universal" languages are based on roots that the jungle tribes never heard.

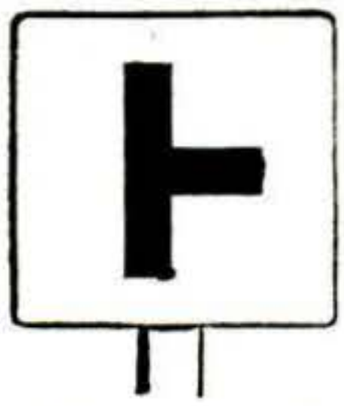
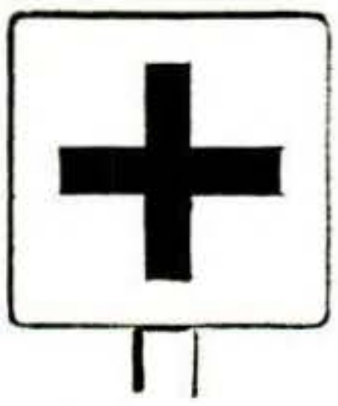
But there is one simple language the world has largely overlooked. You see it every time you drive your automobile. It's ***sign*** language.

People have tried all kinds of language (even gesture language that includes wiggling your ears). But a simple way of talking with those Amazon tribes might be with a pencil and pad—***provided you both had a little sign schooling. (Even "natives" are going to school nowadays.)***

In China, nobody knows all the dialects. But you can talk with other Chinese by writing. There's no mistaking a river when it looks something like this: 川

Or house: 宀

It's not much of a jump from that to these, when you see them on a road in any country:

Thus road signs are becoming an international picture language.

UNDERSTANDING these sign-words is one thing, but saying them is another. It may be centuries, some linguists believe, before we speak a common tongue.

One trouble is: we can't all even make the same sounds! Stick your fingers in your ears and make an "sss" sound. Now make a "zzz" sound. Hear the throat-buzz you've added? Well, a South German can't make that buzzing. He's never had to learn how.

Short-circuit No. 2 is: we don't even think the same. Suppose someone asks you, "Have you never been to the North Pole?"

In America you say, "No."

But in Thailand and some other countries you say, "Yes!" (Yes, you've never been to the North Pole.)

How can the world live with itself when "no" means "yes"?

The third big problem is this: everybody talks differently every day. It's hard to shoe a horse if he won't stand still. And your language is like a horse. How can people learn

[Continued on page 258]

What's happening to reading

The short diagonal streamer above is a pasted-up strip of book pages representing an hour's normal reading. The long streamer represents an hour's reading by faster methods outlined in this article.

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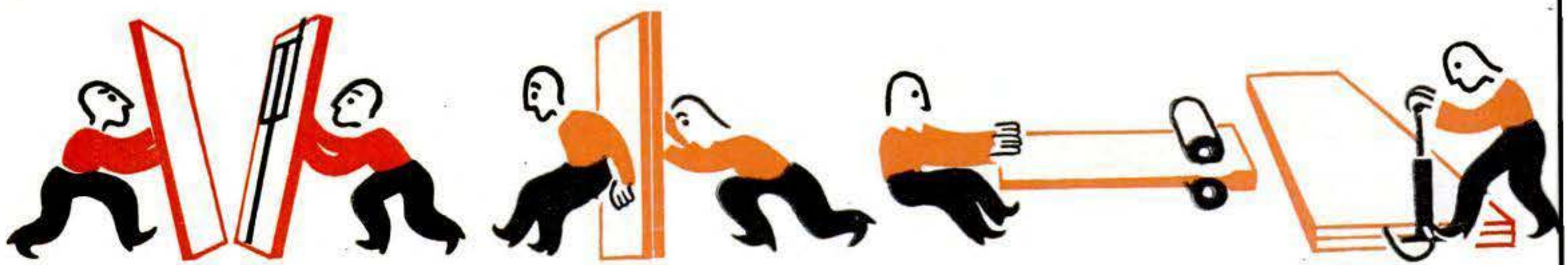
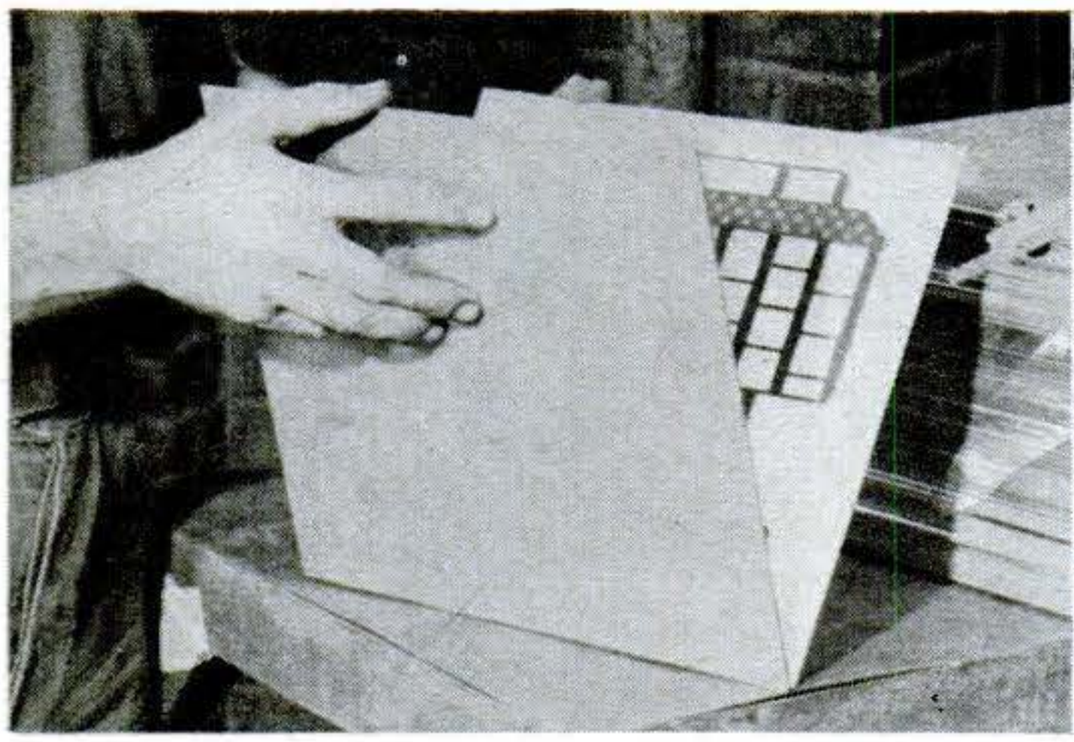


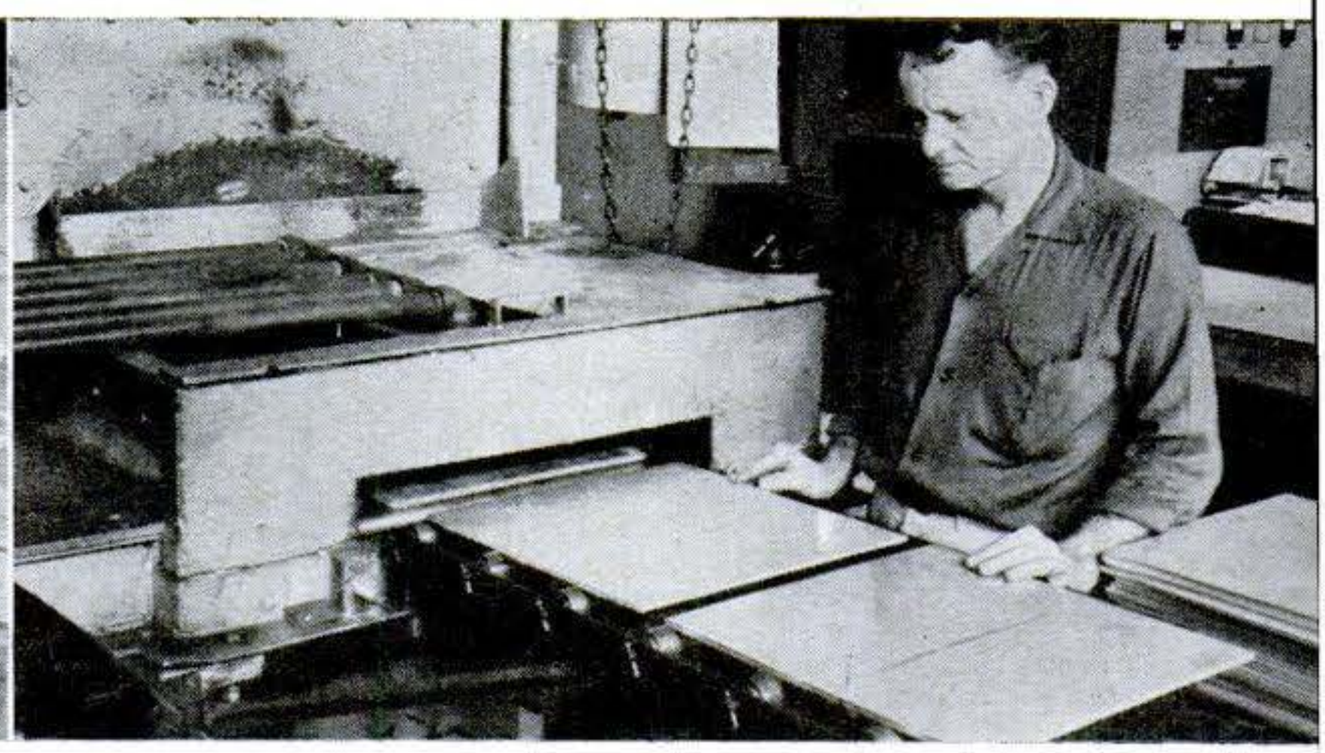
Now They 'Print' Metal

Heat, hydraulic pressure and a paintlike compound perform a slick feat of modern magic.

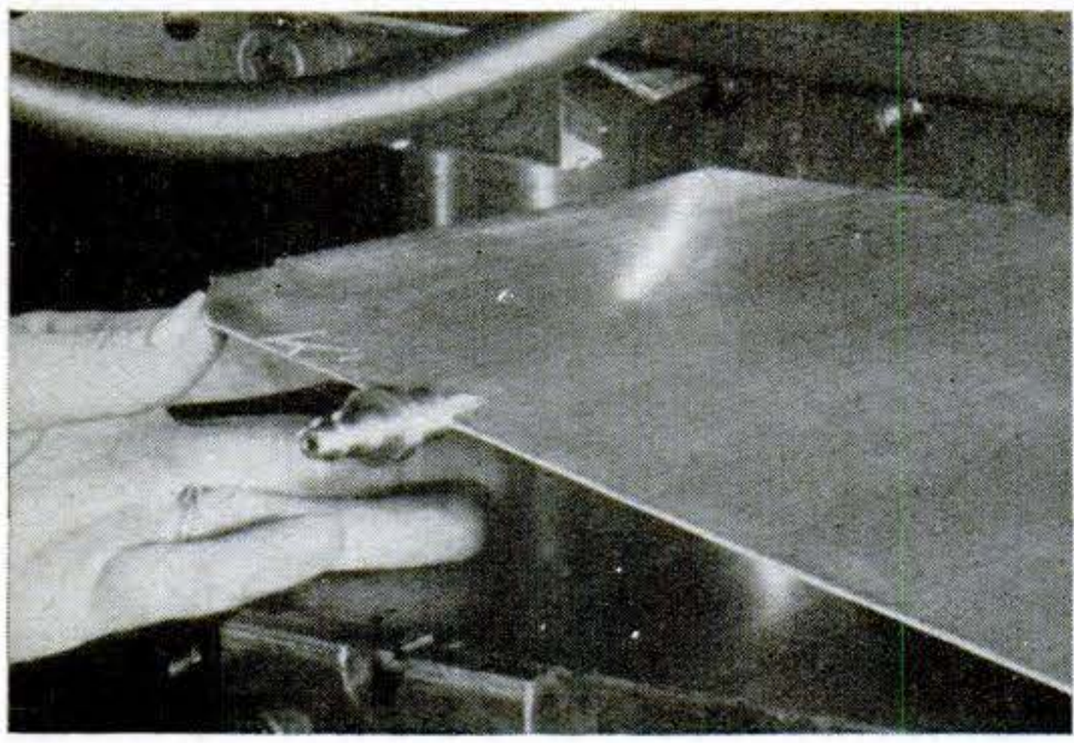
BY "PRINTING" tubing into metals, a new mass-production method rivals printed circuits in electronics. First products are home-refrigerator parts. Car radiators, air conditioners and solar home-heating panels may follow. Developed by the Metals Division of Olin Mathieson Chemical Corp., East Alton, Ill., the process applies to sheet metal a paintlike compound that keeps metals from bonding under heat and pressure, in any desired tubing pattern. Hot rolling bonds a second sheet to the first, except along the pattern. Then hydraulic pressure bulges non-bonded portions into tubes.



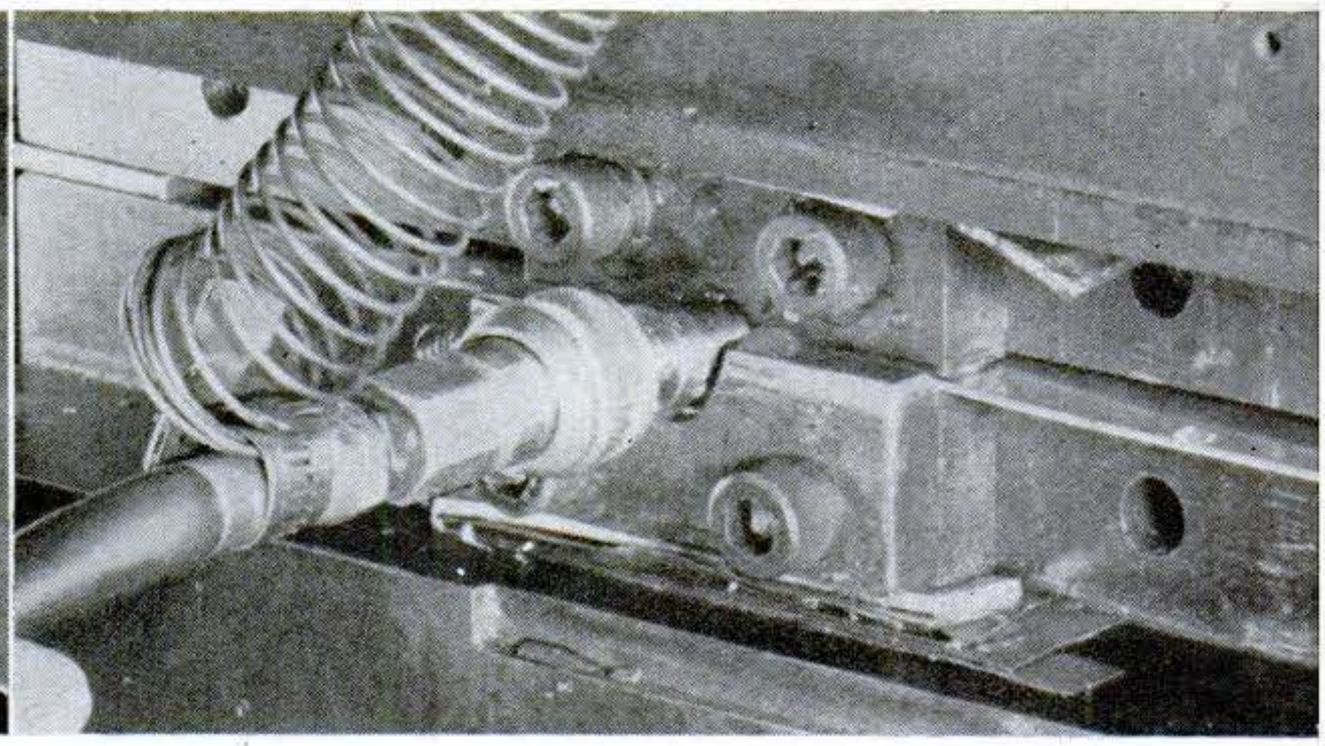
1 DESIGN FOR TUBING, applied to metal by silk-screen process, consists of weld-preventing compound. Joining printed and blank sheets (above) sandwiches pattern between them.



2 INTO FURNACE, on way to being rolled, go pairs of sheets spot-welded at corners. Hot rolling bonds them. Then cold rolling reduces the bonded metal to desired thickness.



4 HOLLOW NEEDLE, inserted in edge of bonded sheet at lead-in to tubing design, makes connection for hydraulic pressure that will dilate the metal and form the tubes.



5 LIKE A MOLE, hydraulic pressure burrows along pattern, stretching metal into tubing. Faces of press, by limiting the bulging, control tube's size and mold its flat sides.

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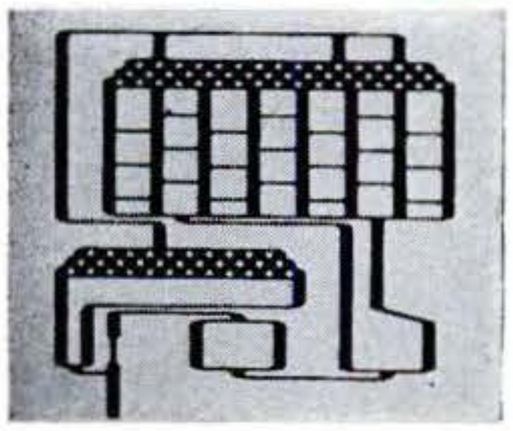
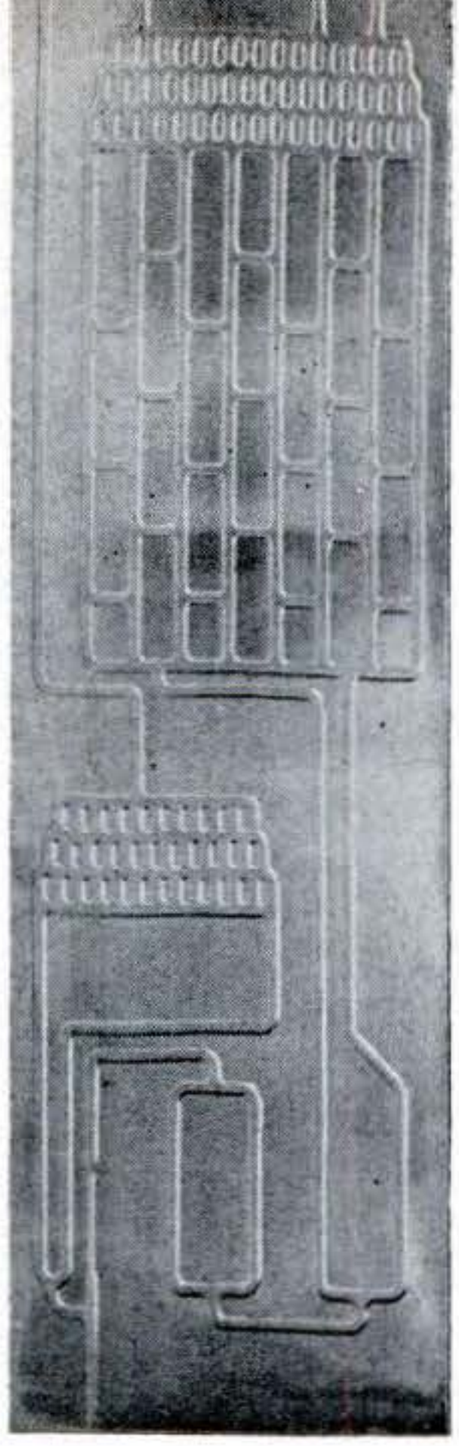
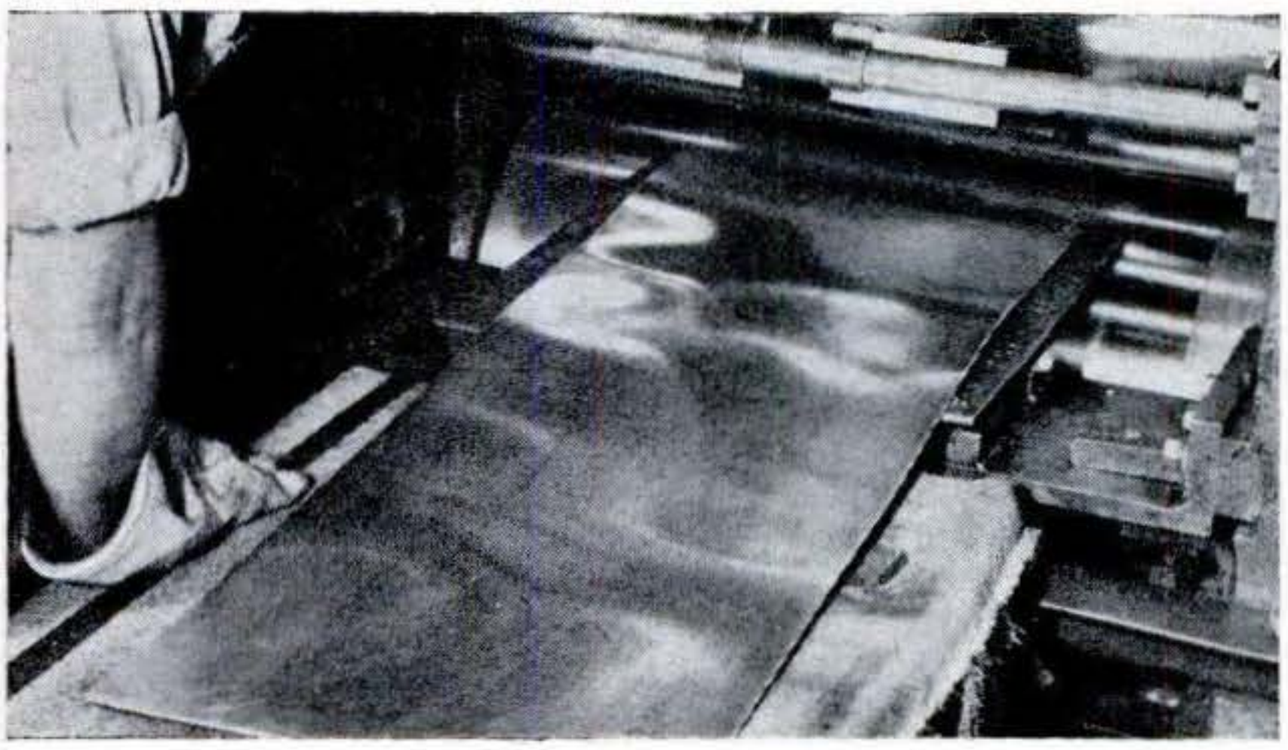
Tubing

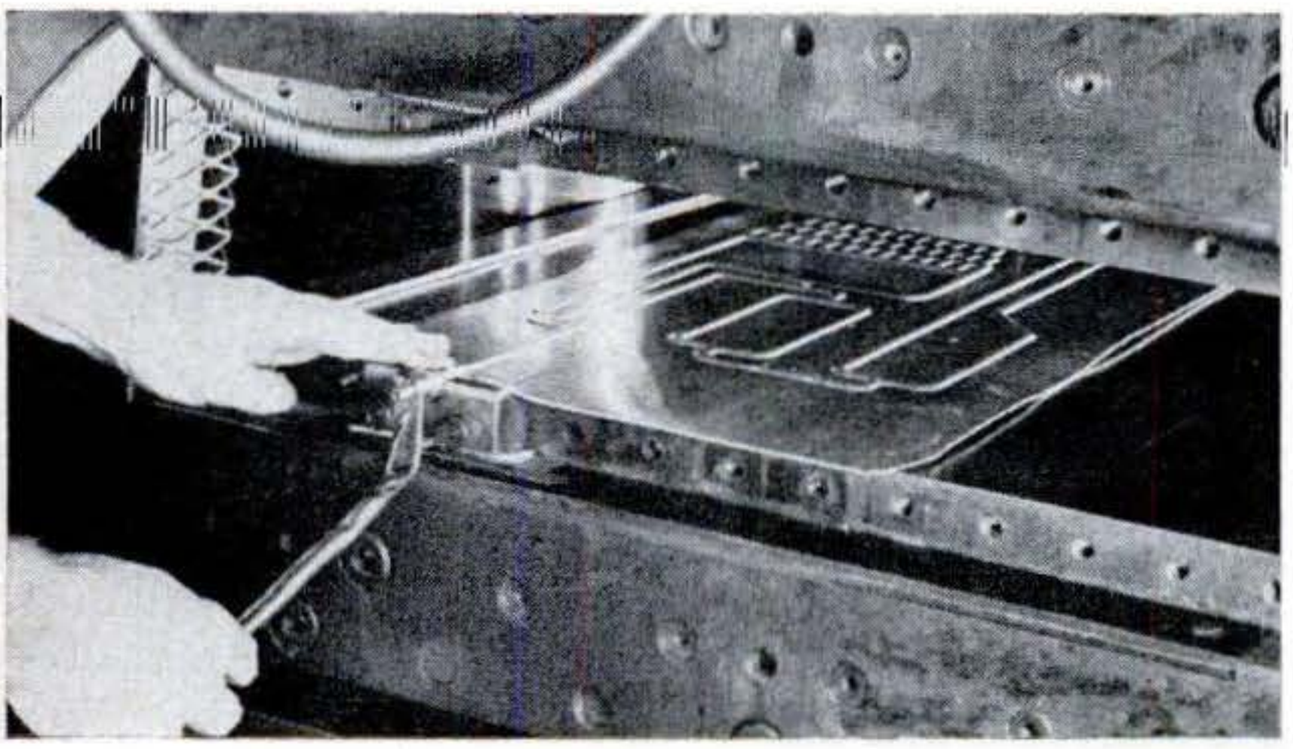


PRINTED PATTERN on metal sheet above becomes tubing in finished refrigerator part, right.





3 EMERGING FROM ROLLER, pair of aluminum sheets has become an elongated and solid ribbon—firmly bonded everywhere except where the "stop-weld" compound was applied.



6 RESULTING TUBING in sheet is revealed by lifted face of press. This piece is an evaporator plate for a household refrigerator, and refrigerant will flow through the tubes.

Cereal Carton Plays a Tune

CUT it out, punch its center, and the record on this cereal carton will enliven breakfast with music. Thus General Mills now adds entertainment to breakfast food. Each 5¼-inch, 78-r.p.m. record plays about 50 seconds. Tip to collectors: eight different titles can be found.

Electric Goose Decoys Birds

POWERED by a tiny outboard motor that runs on four flashlight cells, the glass-fiber goose above will bob straight through the water, or circle when fitted with an underwater weight. Built by Tom Bronson of Memphis, Tenn., the electric goose is not on the market as yet.

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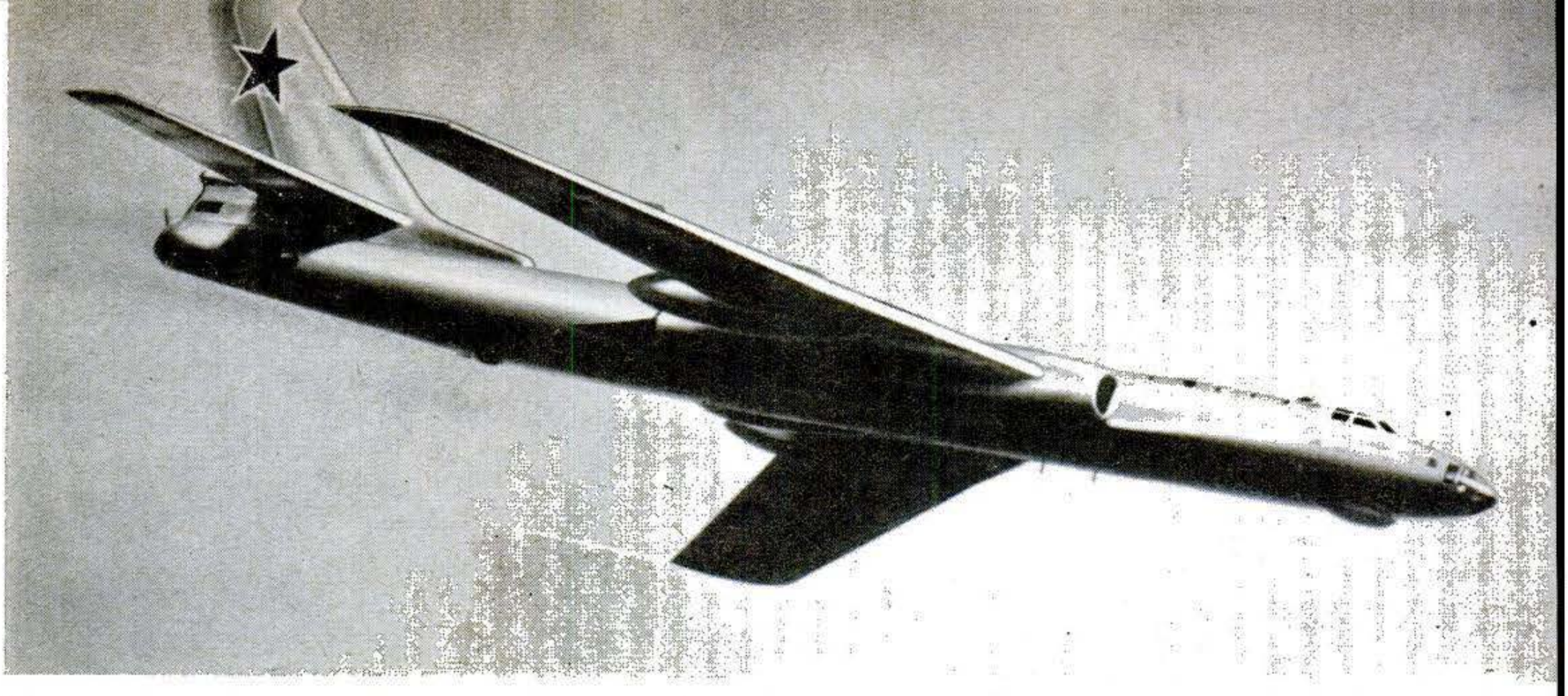

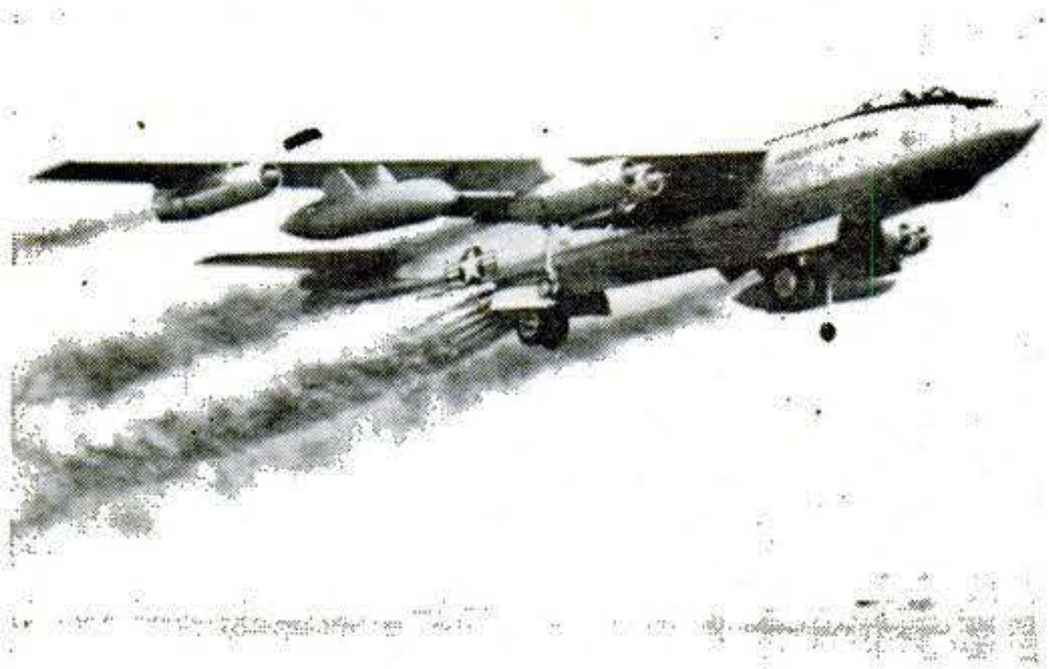

Badger, new twin-jet bomber, is in a class with our B-47

This swept-wing, twin-jet medium bomber (Type 39) could reach any important target in Europe, Asia or North Africa, says General Nathan F. Twining, Chief of Staff of the U.S. Air Force. Authorities on aircraft say that it is comparable to the U.S. B-47, swept-wing, six-jet medium bomber shown taking off at left. If so, Badger must come close to the B-47's top speed of over 600 m.p.h., range of more than 3,000 miles and bomb load of more than 20,000 pounds.

How Soviet Warplanes

BADGER, Bat, Beast, Bison, Bob, Bosun, Buck, Bull and Butcher have suddenly become important names in Naval Intelligence circles. They are among the new code words recently chosen to identify known Russian bombers, light, medium and heavy.

The Soviet Air Force is said to number

Bosun, light and fast bomber, outmatched by the B-45

A Soviet naval twin-jet bomber, Bosun (left) can top 460 m.p.h. Its range is over 600 miles, its bomb load about 6,000 pounds. The B-45 (above) has a top speed of over 550 m.p.h. Its range is better than 800 miles. It can tote more than 10 tons of bombs.

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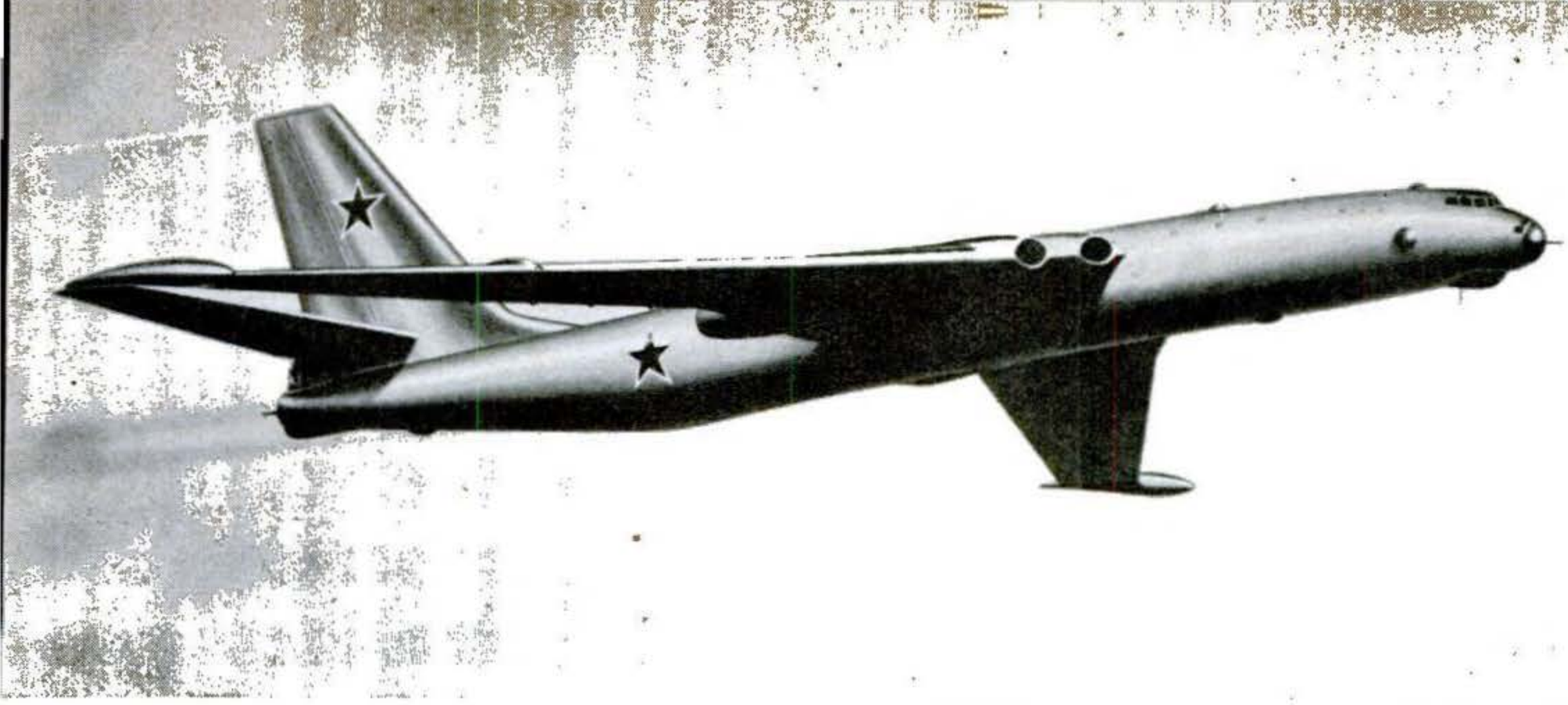
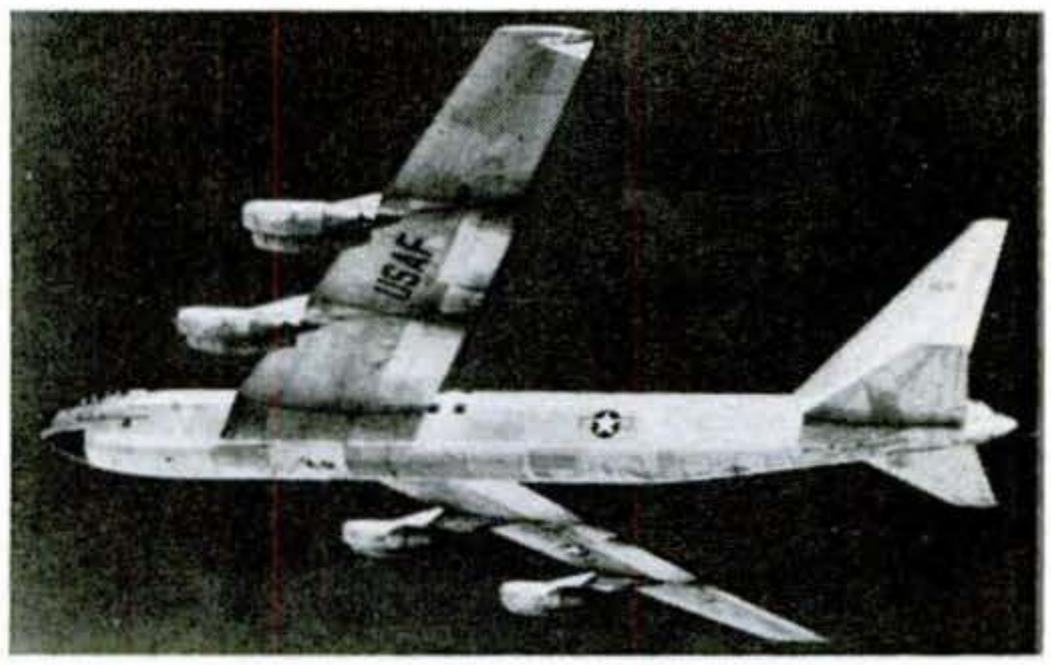


Bison, with only four jets, rivals the B-52, with eight

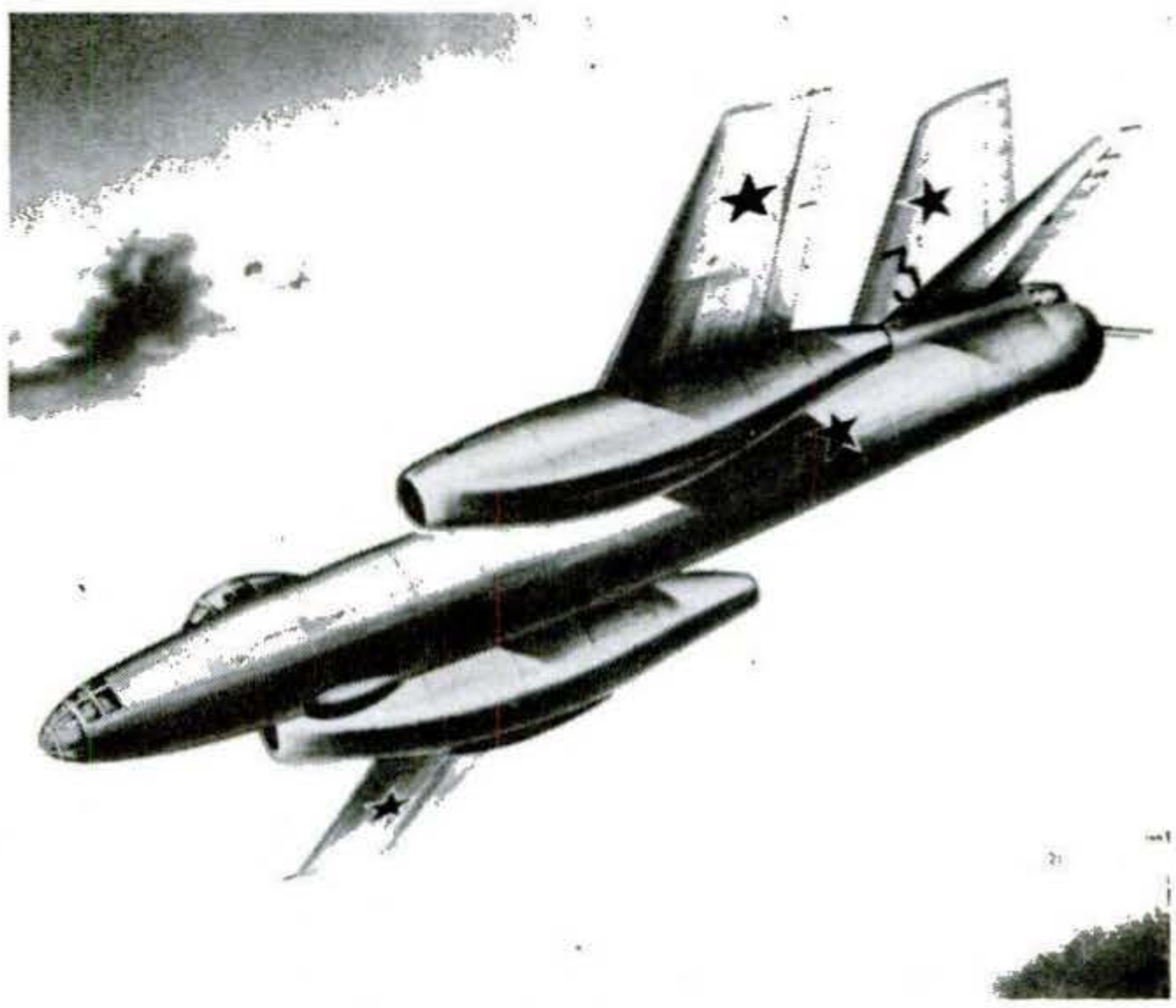
Built for intercontinental missions, this new Soviet heavy bomber (Type 37) is a sensation. Its four jets may produce 15,000 pounds of thrust apiece, far better than our best so far. Bison's top speed, 600 m.p.h., is less, however, than that of the B-52 (right) and so is its range, estimated at about 5,200 nautical miles to the B-52's 6,000 or better. Bison is said to be able to carry 11,000 to 22,000 pounds of bombs. The B-52 can transport over 20,000 pounds.



Look Alongside Ours

20,000 aircraft in combat formations, as opposed to our own 12,500.

Along with names for the principal Soviet military planes, the Navy also has begun to turn out drawings of them in order to help its personnel spot them. The first six drawings released are reproduced on these pages. Cargo planes



Butcher has a nasty rival in the formidable U.S. B-57

The Russian twin-jet bomber at right, which the Allies feared might be used in the Korean War but never was, can fly faster than 600 m.p.h. and farther than 600 miles with a bomb load of about three tons. So can the B-57 (above), with very heavy armament.

Please turn the page for more pictures of Russian planes

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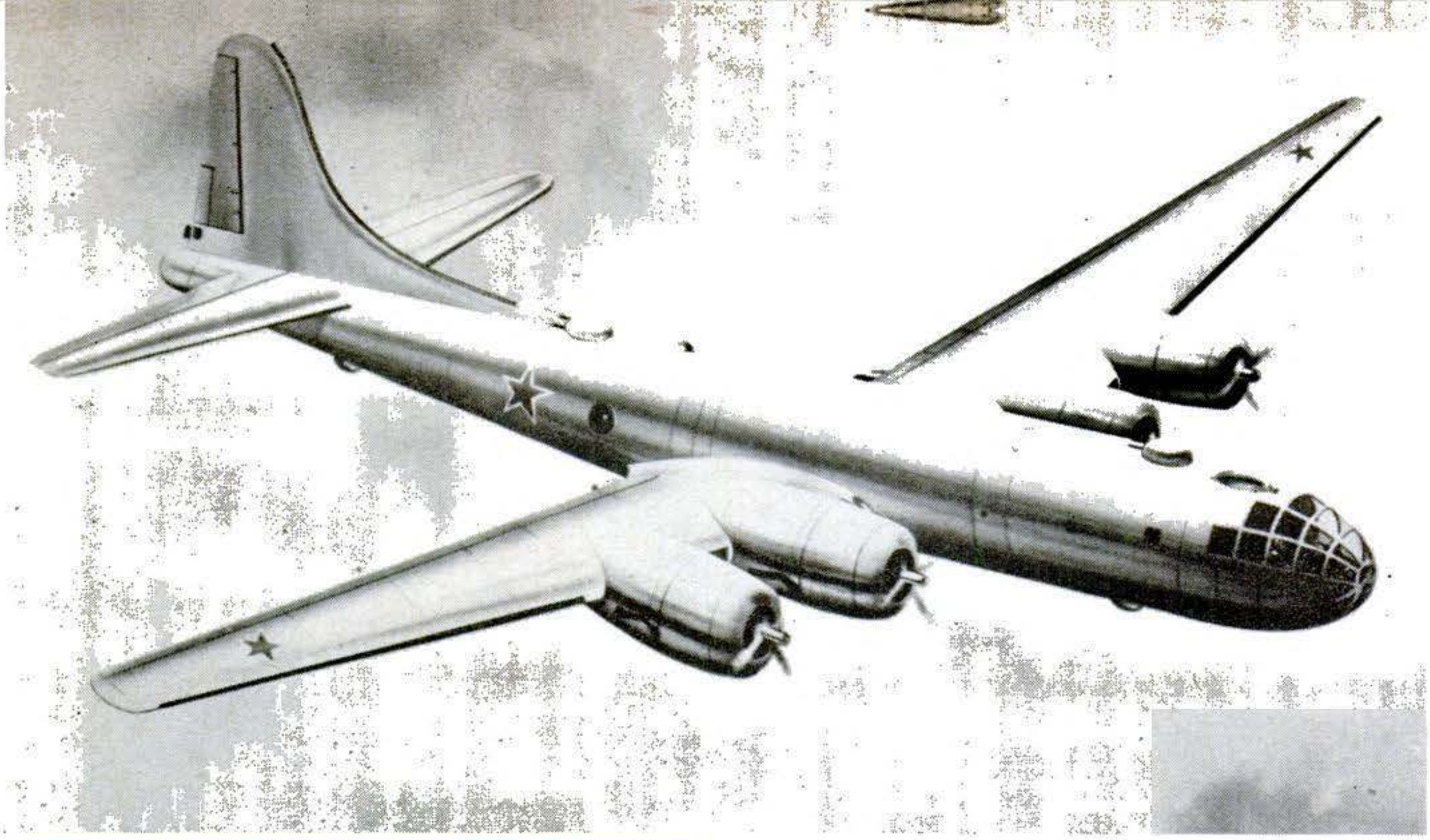
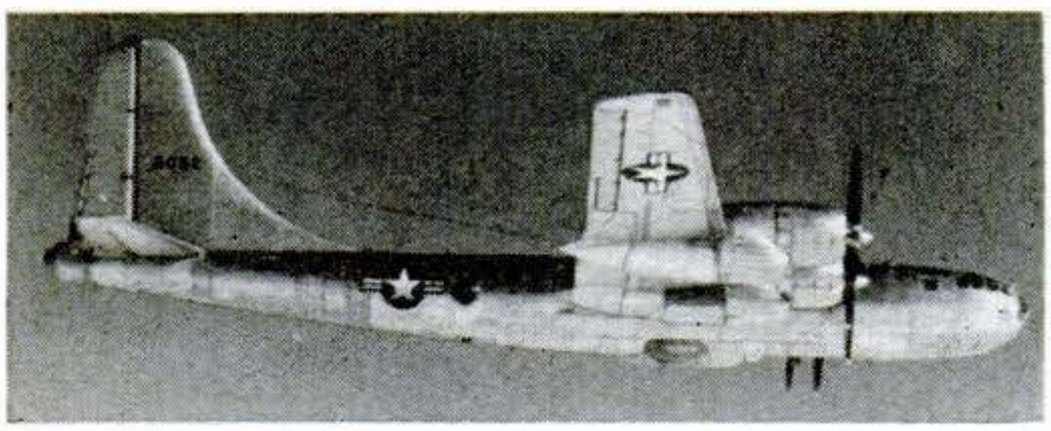




Two able work horses, alike as peas, both headed for the bone yard

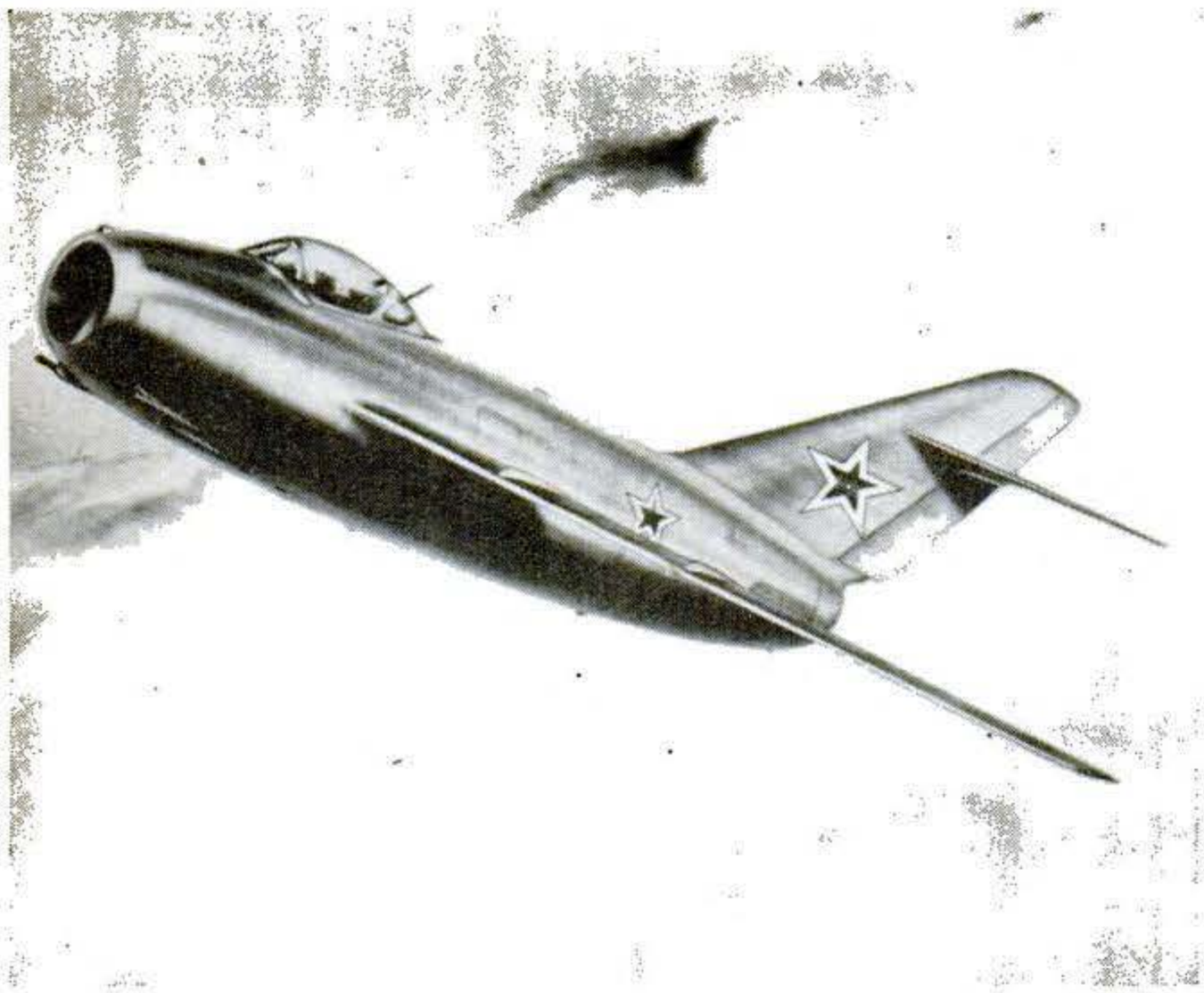
Bull (above), a souped-up Soviet copy of our B-29, looks like the B-50 (left), has about equal top speed (about 400 m.p.h.) and bomb load (10,000 pounds). The B-50 has greater range (over 6,000 miles). Jets are supplanting both.

will be given names beginning with C. Coach is one already chosen.

Most fighter planes will get names beginning with F, like Fang and Frank, though the chances are that the MIG, already so well known by that name, will not be rechristened Fig.

Such names will be used by the Navy to prevent misunderstandings and confusion in radio communications. They are also short and easy to learn.

This is a system of identification that was begun during the campaigns against the Japanese during World War II. Remember Zero and Betty?—*Wesley S. Griswold.*



Swift MIG, though improved, can't match our F-100

Russia's ace fighter, the MIG-15 (left), is being replaced by an improved version, the MIG-17, said to be supersonic. But U.S. military experts think that our F-100 (above), supersonic at all altitudes, is superior in speed and in other characteristics.

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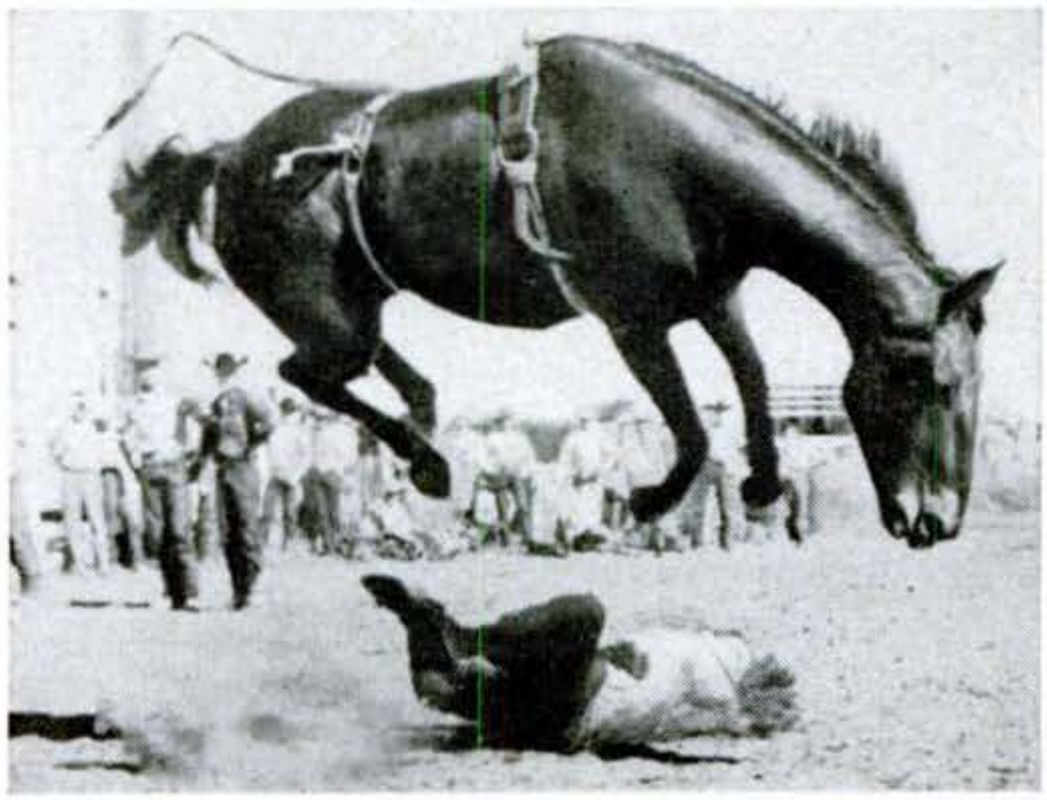
New Treatment Cures Black Eyes Quickly

Raw beefsteak and hot and cold compresses are now outmoded; injections of an enzyme make shiners subside in three days.



BRUISES ARE THE LOT of cowpokes who ride bucking broncos for money. With trypsin, rodeo doctors put them back to work pronto.

By Marguerite Clark

THE traditional remedy for a black eye—applying raw beefsteak to relieve swelling, discoloration and painful throbs—has been condemned by eye specialists. If you have a shiner, and a friend offers you a chunk of steak, eat the steak and consult your doctor.

For something better than the time-honored beef poultice has been worked out for black eyes. Injections of trypsin (pronounced trip-sin) now take out the pain and swelling within a few hours. Those gorgeous tints of purple, black

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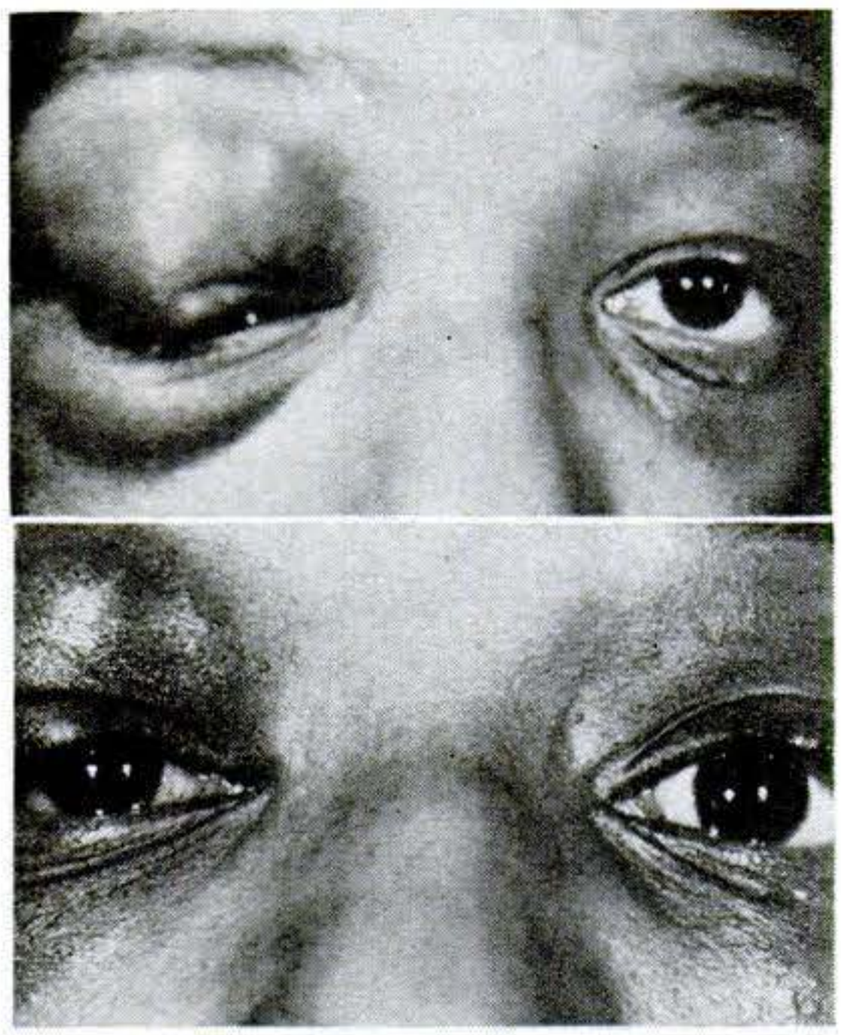
and blue may remain for the usual ten days, but are sometimes prevented entirely if injections are given *immediately* —within minutes of the injury.

Results Are Dramatic, Say Doctors

Black eyes have been treated this way at the Philadelphia General Hospital by Drs. Joseph M. Hopen and Francis N. Campagna. These eye specialists have just made a preliminary report in the *Journal of the Philadelphia General Hospital* on the use of trypsin in acute eye ailments. Their method has brought improvement "verging on the dramatic" in several dozen cases.

A 30-year-old man, struck in the left eye with a blackjack, was admitted to the hospital in intense pain. His eye was badly discolored; the eyeball was swollen to the size of a lemon. Routine treatment for this condition —first ice-cold compresses, then warm packs—failed to help. So did surgery, performed to relieve the tremendous pressure on the globe of the eye. The doctors even tried two other chemicals with jawbreaking names—streptokinase and streptodornase—but there was no improvement. A week later, Drs. Hopen and Campagna gave the man intramuscular injections of trypsin. In 24 hours, pain and swelling subsided. Soon the man was able to close his injured eyelids. After six days, the shiner was completely cured.



BLACK EYE (top photo) was still swollen shut after a week of conventional treatment with hot and cold compresses. Then trypsin was administered. Lower photo shows the same eye 24 hours later, almost normal.

Another patient, a 45-year-old-man, had been severely beaten about the face and eyes. Both his eyes were swollen shut. The many cuts on his eyelids were stitched with difficulty because of the profuse, watery swelling. Twenty-four hours after he was put on trypsin injections, the left eye was open, the swelling was going down rapidly in the right eyelid, and the man was well on the road to recovery.

Trypsin is an enzyme secreted by the pancreas to help digest food. On black eyes, doctors use a special purified crystalline trypsin from the pancreas of cattle. It is called Parenzyme by its manufacturers, the National Drug Company of Philadelphia. Each dose amounts to less than an 11,000th of an ounce of trypsin in sesame oil. The average patient gets two shots daily for seven days. The delicate tissues around the damaged eyes are not touched. Since this powerful enzyme acts on the entire body, injections are made in the big, tough muscles of the buttocks.

Prize fighters were among the first to benefit from trypsin's healing power. With Parenzyme (2½ milligrams twice a day) their severe bruises and shiners have been cleared up in about three days. That is three times faster than with the old compress treatment. Several doctors who specialize in "fight-night" injuries are now using the enzyme on their patients.

The stepped-up pace of modern living has increased the number of eye injuries from accidents. Despite your friends' wisecracks, a black eye is no joke. A severe blow may damage the delicate eye structure; it may cause detachment of the retina, cataracts and ruptured eyeballs.

Everyone with an injured eye should go straight to a doctor.

Eye diseases as well as blackened eyes have been treated with trypsin. At Philadelphia General Hospital, Drs. Hopen and Campagna have had "impressive results" in 70 cases of eye in-

[*Continued on page 262*]

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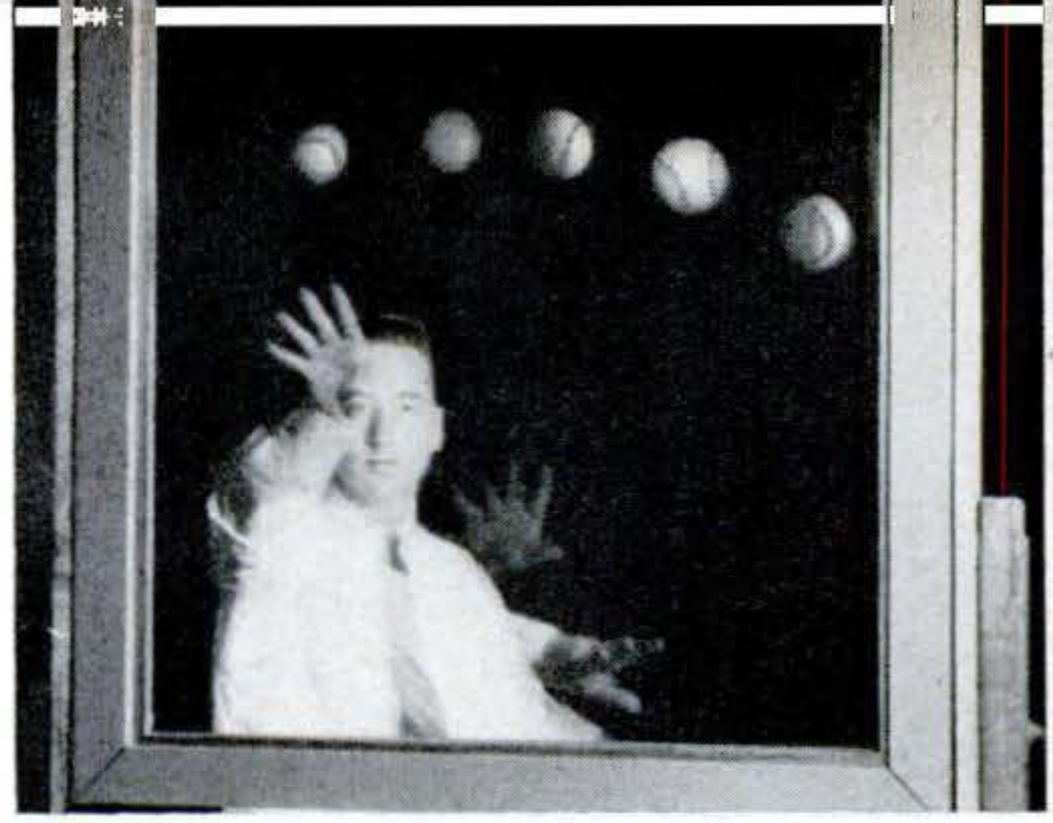
You Can Eat This Greeting Card

THE lady above is eating up that old wish-you-were-here routine—she's biting into an edible greeting. Sealed in cellophane, the marzipan post card was mailed from the International Exhibition of Gastronomy and Tourism in Munich, Germany.



Plastic Makes Ball-Proof Pane

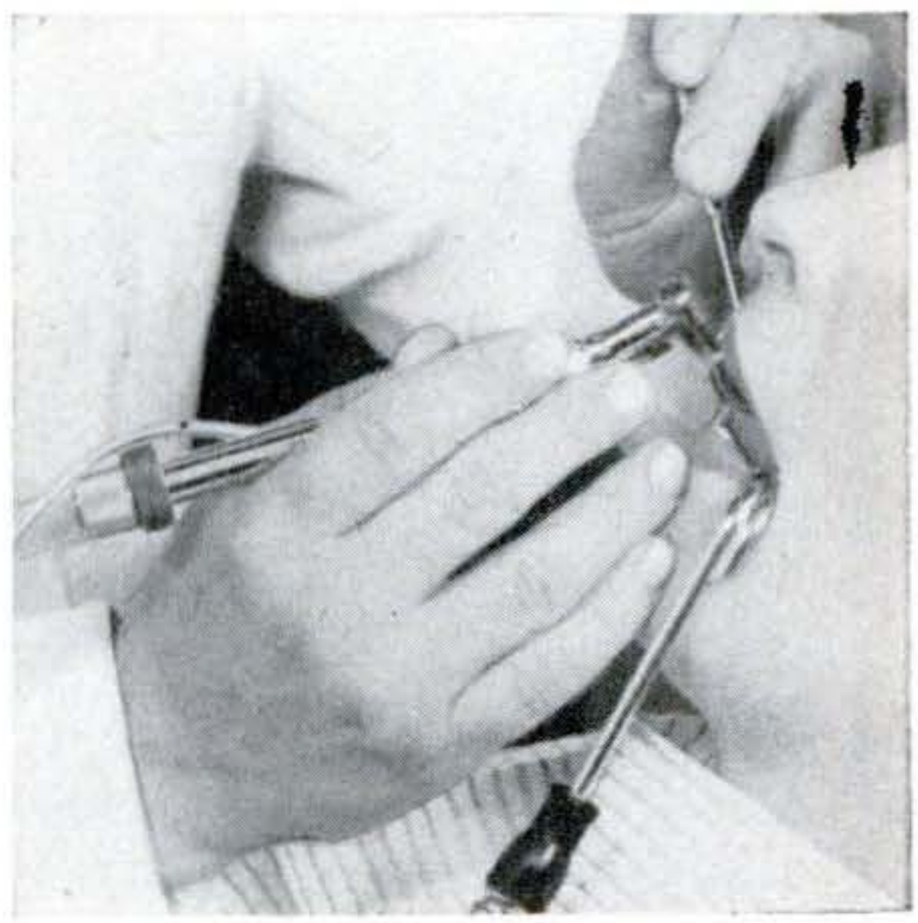
A NEW plastic film (above) is so tough that a hurled baseball won't break a storm window glazed with it. It can also be metalized, wood-grain printed, backed with fabric for upholstery, and laminated to metal or plywood. DuPont calls it Mylar.

Air Force Stores Tools in Mine

THIS old limestone mine in Wampum, Pa., is being cleaned up to store surplus machine tools for the Air Force. Half of its more than 4,000,000 square feet will be converted into a warehouse.

Hydraulic Drill Is Easier on Nerves

A HYDRAULIC turbine in the dental drill at right spins the business end of the tool 61,000 times a minute. At this speed—almost 10 times the r.p.m. of an electric drill—cutting pressure, vibration, heating—and pain—are said to be greatly reduced. The National Bureau of Standards working with the American Dental Association and the military medical services designed and constructed the new drill.



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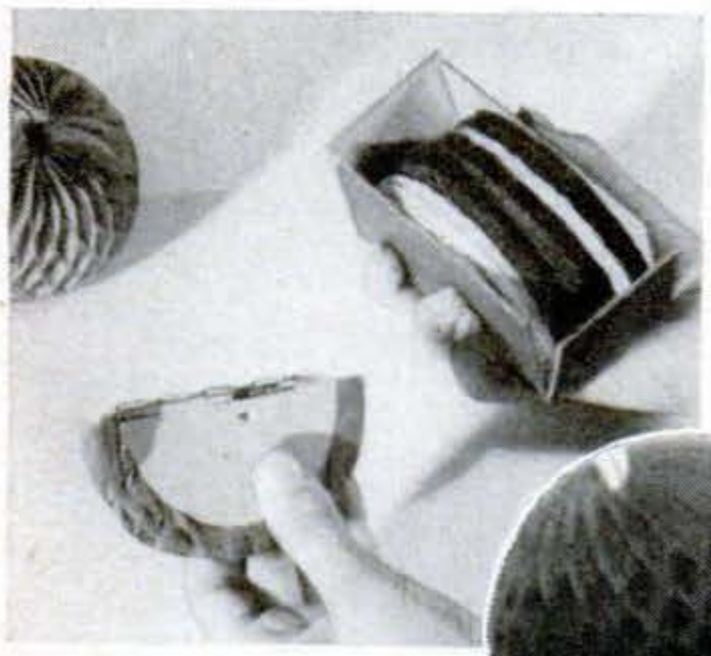
Fun's Henry Ford Is Still

He's the man who put the buzz in a nation's palm, and gets richer every day by making you miserable.

By Gardner Soule

POP-BALL SURPRISE is trade name for this gimmick. Into box (below) a dozen paper balls are folded flat. Each has tiny spring. When girl opens box, expecting perfume or something, she gets an unexpected result.



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Inventing

SOME people say that Sam Adams invented trouble. Others say, "Nonsense, Sam is only in his seventies." But all agree that he is the Henry Ford of trouble. He has mass-produced it and sold fantastic amounts of it for staggering sums.

He put that phony nail in your tire, the imitation fly in your sugar, the make-believe worm in your salad, the bomb under your automobile starter.

He has 37 patents and has manufactured, during the last 50 years, more than 700 troublemaking items. Things like doorbell buttons that stick pins into your finger and cameras that squirt at you instead of taking your picture. Things that dealers call "joker's novelties" or "funny party goods."

Ever shake hands with someone and jump back from a simulated electric shock? In 1931 Sam Adams invented a small, disklike affair that is carried in the palm of one's hand. A buzzer and a vibrating point in the gimmick do the business when the joker grasps your hand. Sam named this invention the Joy Buzzer. He has sold millions.

He Wants Customers Back Alive

This, he explains, is "an ideal practical joke in that it has an easy mode of operation and does not generate the urge toward mayhem or murder against the joker, who is my customer, and who, consequently, I do not wish to see murdered."

Sam's all-time No. 2 best seller is the Dribble Glass. It is an ordinary-looking glass. But near the rim it has tiny slits hidden by decorations like grapes and leaves. When you hoist the Dribble Glass to your lips, some of its contents ooze down your tie.

NEWEST PRODUCT of Inventor Sam Adams, who shows it off here, is phony firecracker. It does not explode when lit, but when you then pick it up, a cap is set off in the bottom of it.

MOST SUCCESSFUL of all Adams' products has been the Joy Buzzer. When a man shakes your hand with it, you get a simulated shock. It's a big Adams seller at 25 cents each.

Other delightful difficulties that Sam has arranged for imbibers include a wrong-way corkscrew (you have to turn it the other way to get the corkscrew in and the cork out) and a two-way vacuum cup that anchors your glass to the table. It can be pried up with a screwdriver—but can turn out to be a Dribble Glass.

Sam's No. 3 all-time best sellers, after the Joy Buzzer and the Dribble Glass, have been Snake Surprise Cans and Jars. These are all packages of trouble manufactured especially for women. They buy almost as much stuff from Sam as do salesmen, American Legion convention-

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Whatever you want —snakes, butterflies, a swelled head, even explosions (where you least expect 'em) —Sam can supply it.

SNAKE SURPRISE CAN holds three cloth-covered snakes. "When you open it," boasts Sam, "they hit the ceiling!"

DESK SET looks as innocent and decorative as any other desk set. But when you reach for the "fountain pen," an explosion—harmless—results. It's part of Adams' 1955 line.

ers, and dentists (his best customers).

Snake Surprise Cans and Jars include marshmallow cans, cold-cream jars and mixed-nut containers. When any one of these is opened, as many as three cloth-covered, spring-propelled snakes, up to five feet long, jump out.

Adams recommends the use of the Snake Surprise line at wedding showers, bridge parties or any affairs where the girls get together. Breaks the tension, he says.

Help Yourself to a Cigar

The fourth item on the list of Sam's best sellers is the Bingo line. Bingo is the noise Sam thinks is made by a mousetraplike device that explodes a cap (like the cap in a cap pistol). Sam puts this Bingo gimmick into books, decks of cards, cigar boxes. Accordingly, these all explode when you pick them up.

Because American women have been so receptive to his products, Sam is rewarding them this year with a new joy: a lipstick that explodes when they pull off the end.

The bomb under your automobile starter, which uses two Bingo gimmicks, is one of Sam's most spectacular achievements. With the bomb affixed to your starter button, a whole chain of events occurs when you push the button: There is an explosion. There is a loud whistle. There is a discharge of black smoke. There is another explosion. And there may be a sudden departure of passengers from the car, via all exits.

Soren Sorensen (Sam) Adams was, as his full name suggests, born in Denmark. His parents brought him to New Jersey when he was two, where his dad became a dock foreman in Perth Amboy. "I never got near a high school or anything like that," Sam says. "Anything I did pick up I got through experience, application, meeting problems as they came along."

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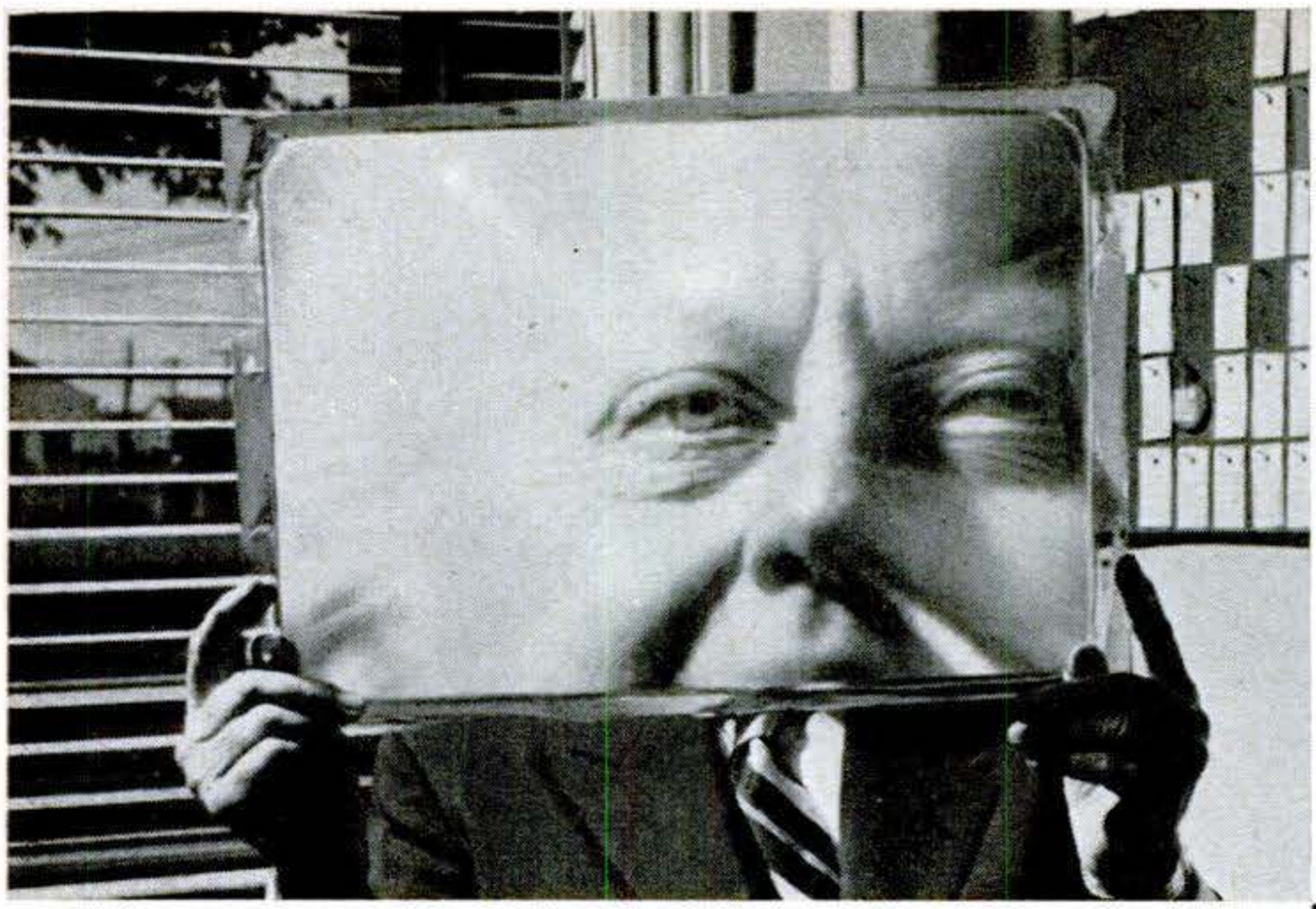
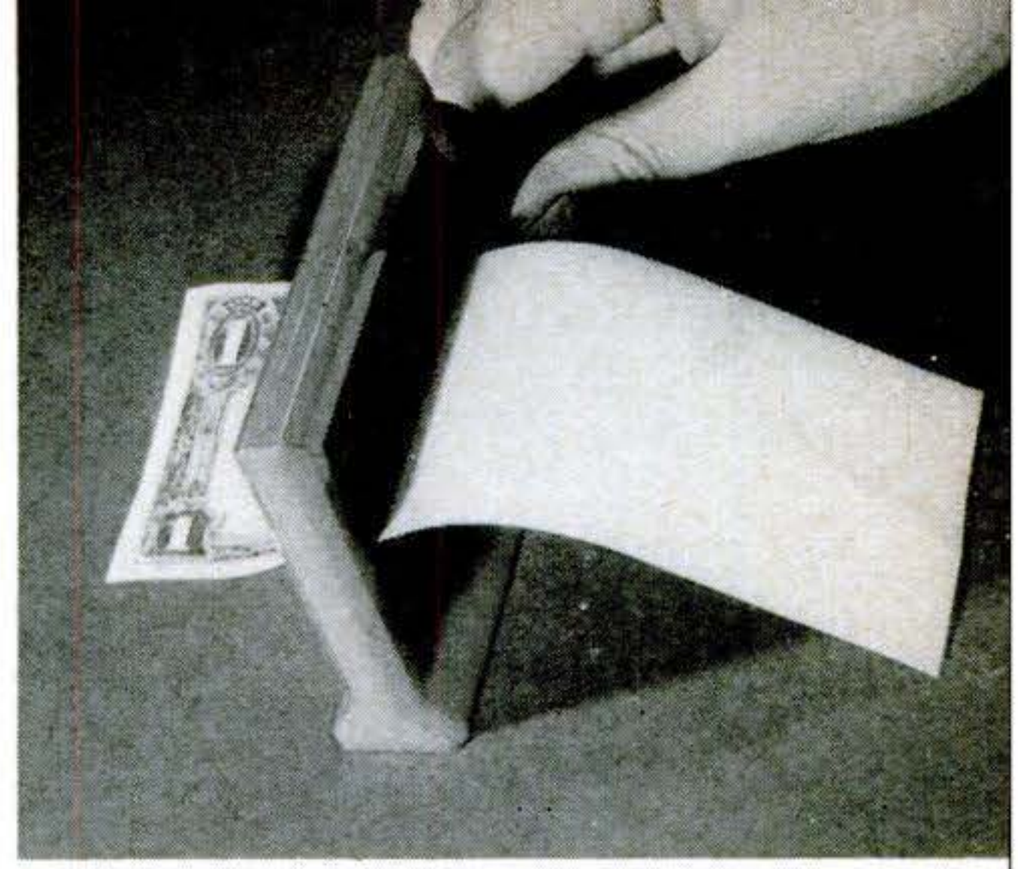
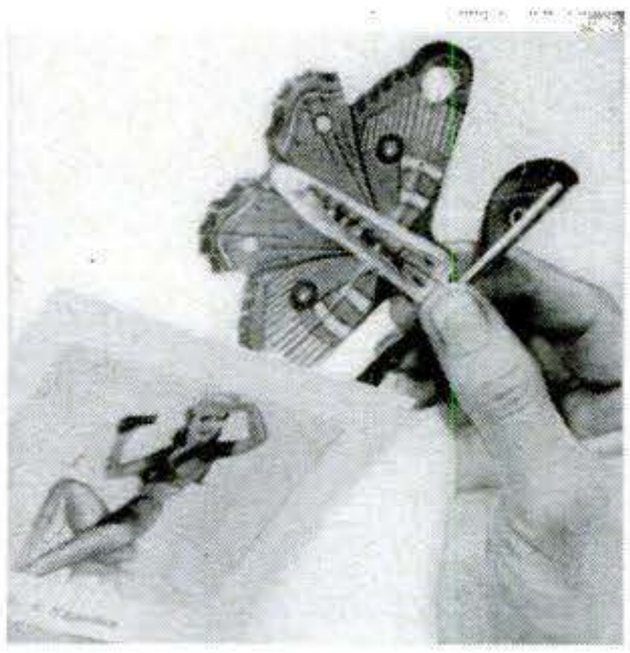


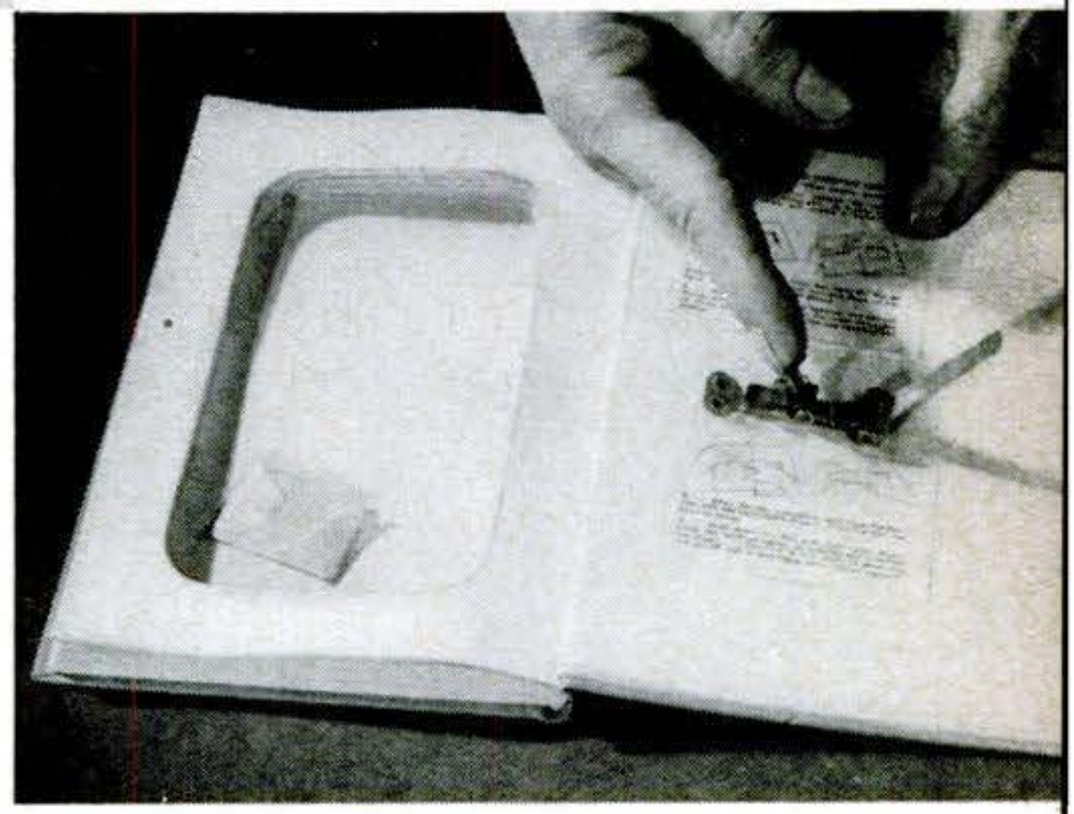
EXPERIMENTAL GAG, not yet on market, is magnifying screen you hold in front of yourself while in serious conversation. It can startle your friends.



HOW TO MAKE MONEY: You insert blank paper in one side of this Adams gadget, and out comes a real bill.



BUTTERFLY slips inside a greeting-card envelope, then flies across room when envelope is opened. A rubber band propels it.



EXPLODING BOOK contains device to set off caps like those used in cap pistol. Pages are hollowed out to give the cap device room in which to operate.

By 1906 young Adams had become a salesman of coal-tar products. He did not like the job. To make matters worse, one of the products he sold, a powder, made him sneeze. To liven his drab existence, Sam got to blowing spoonfuls of it into rooms full of people.

The reaction was startling. People liked it when he made them sneeze. "I can't explain it," Sam says.

So he named the dust Cachoo Powder, and sold it for that purpose (which had not occurred to his employers). Cachoo Powder was as contagious as a sneeze. Adams, in effect, turned his coal dust into gold dust. He took in $150,000 and he was in the "funny party goods" business.

After the market for Cachoo Powder dried up, Adams looked around for another way to peddle disaster, and his eye fell upon the housewife. She reacted strongly, he observed, to inkstains. So

[Continued on page 282]

INSIDE ADAMS' FACTORY, girl worker places explosions in exploding books. Adams buys thousands of unsold books from publishers to fill a demand that seemingly goes on forever.

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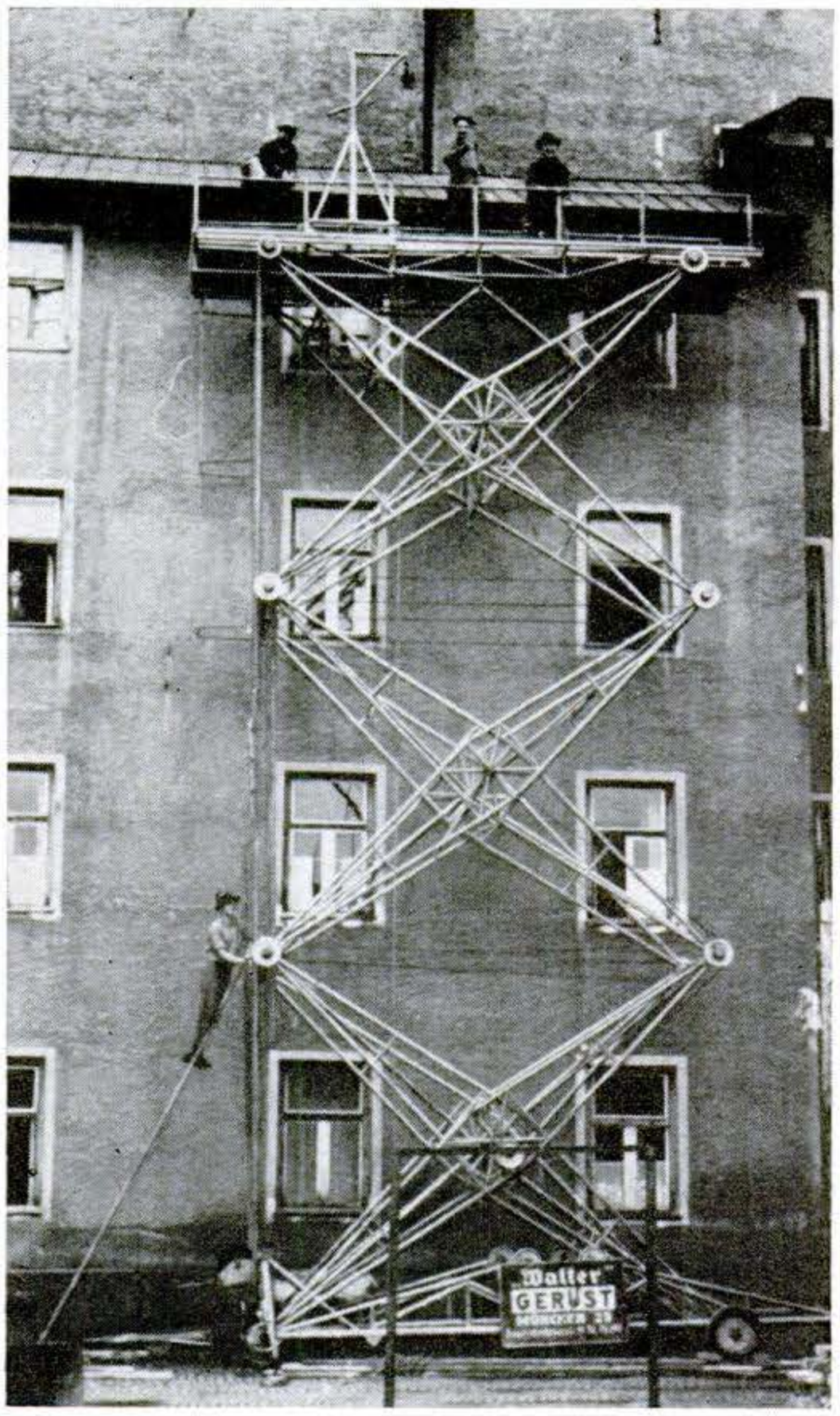
Odd Machines From Europe Do Hard Jobs The Easy Way

The scoop swings in a half circle so that this baby earth mover can lift and dump loads without moving. Its 45-hp. diesel engine runs the hydraulic arm which also takes a claw or crane. Ahlmann-Carlshuette K.G., Rendsburg, Germany, is the maker.

Portable sawmill can be hauled right into the forest where it sheds its wheels and is bolted to wooden sleepers. Its several interchangeable saws are driven by a gasoline engine. Adolf Mueller, Scheessel Bez., Bremen, Germany, makes it.

A mechanical helper rides with English truck drivers to load and unload heavy goods. Powered by the truck engine and controlled by a lever at the side of the cab, it lifts, swings and lowers cargo hydraulically. Lorry Loaders, Ltd., Plant House, Ealing, London, W. 5, is the maker.

Scissor-jointed scaffold of steel shoots up like the old-fashioned pop-up toy of hinged wooden slats. Ball-bearing wheels and a swivel-mounted front axle make it easy to tow it to the job. It can be opened and folded by hand or a motor can be added. It is made by Arbeitsgemeinschaft Seibert-Stinnes, Muelheim (Ruhr), Germany.



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All's Quiet in World's Largest Echoless Room

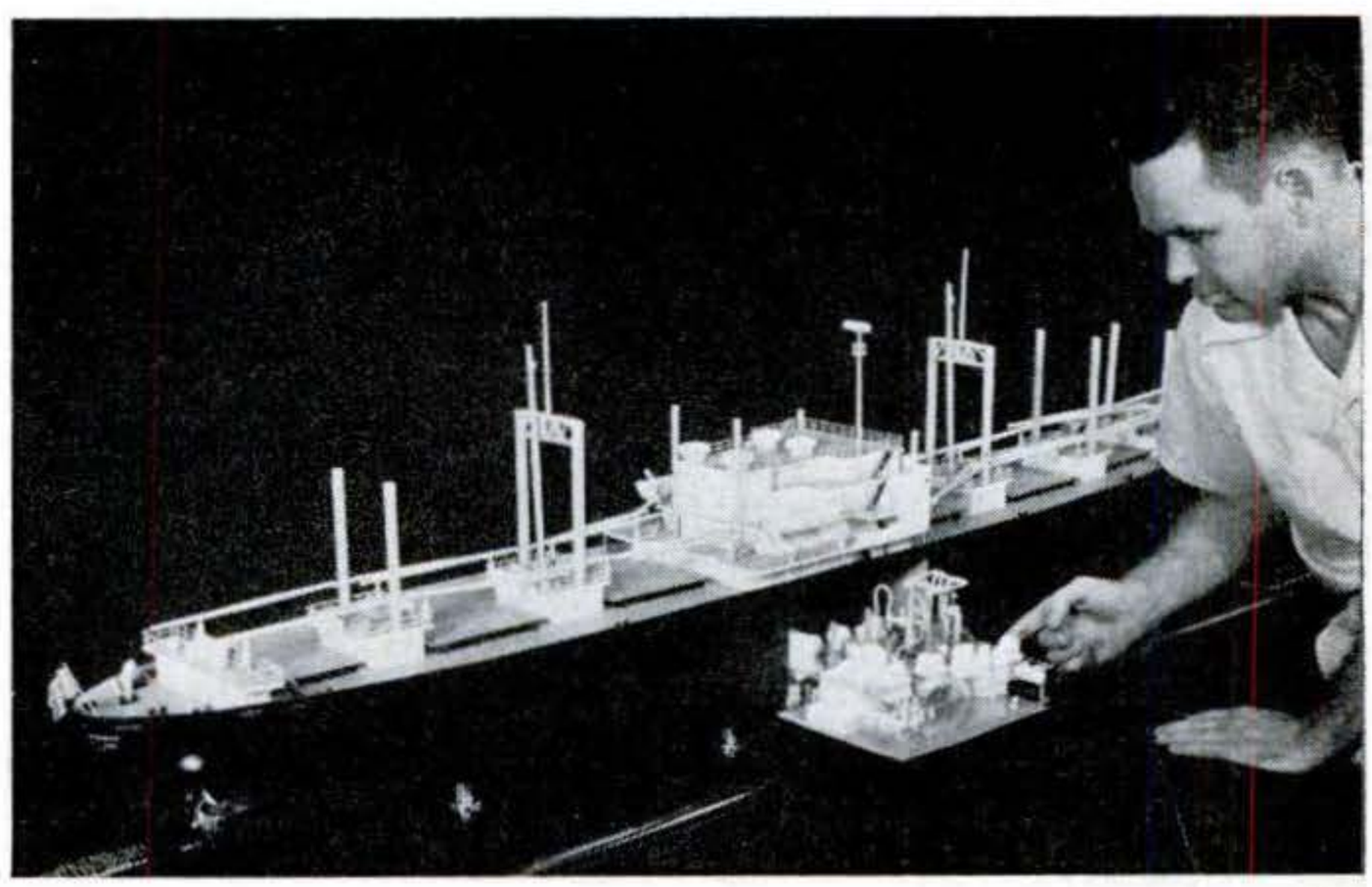
IN THIS echoless chamber, the world's biggest, General Electric engineers search out ways to quiet the hum of big transformers.

Walls five feet thick block outside sounds and more than 12,000 glass-fiber wedges lining the four-story-high room soak up noise inside. A network of interwoven cables protects the wedges on the floor. Two 30-ton doors sealed with inflated tubing close on the engineers at work within.

New Rifle Kills Tanks at Twice the Range

LIGHT enough to be toted by three men or mounted on a jeep, the Infantry's 500-pound BAT (battalion anti-tank) rifle shoots twice as hard and far as older weapons. A spotting rifle atop the barrel of the 106-mm. recoilless rifle fires tracer bullets that flash when they hit the target, eliminating the need for a fragile range finder.

More Room for Cargo in Atomic Freighters



THE atom-powered freighter of the future might look like this model, built by the Newport News (Va.) Shipbuilding Co. "Burning" fissionable uranium, the freighter could stay at sea for years without refueling. And it would carry more cargo, too, for big oil tanks could be eliminated. A sliding tray on the model pulls out to show the atomic machinery.

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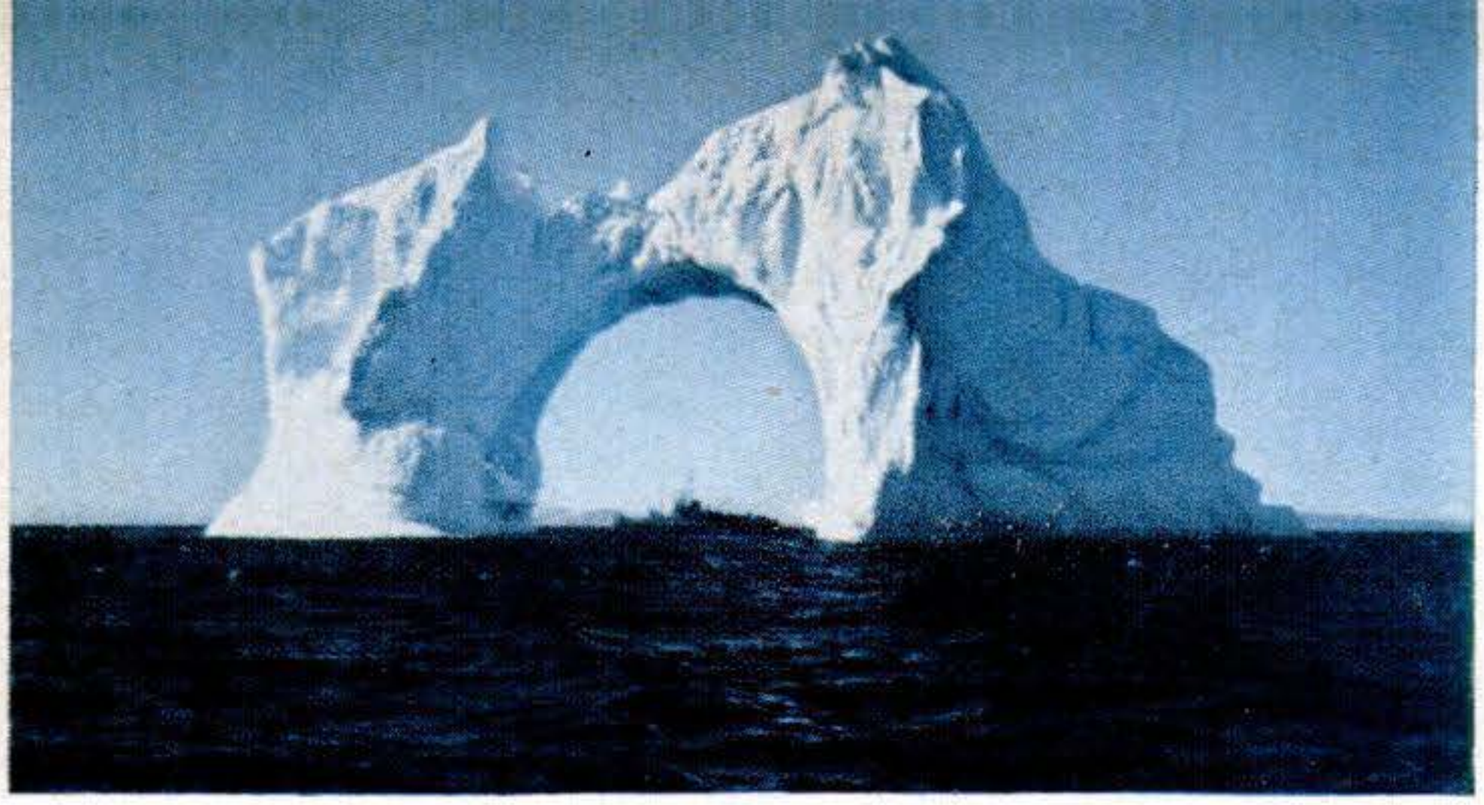

The first installment of a two-part report on the U. S. Navy in the Arctic.

Last summer the USS Atka broke Arctic ice; now it's in the Antarctic. A PSM reporter takes you aboard for a voyage to our far-north outposts.

Ships That Prowl in Polar Seas

By Herbert O. Johansen, with photos by W. W. Morris

FIVE months ago the data board in the wheelhouse of the USS *Atka* carried the notice: "Sunrise, July 28. Sunset, Aug. 16." We had crossed the Arctic Circle and were bound for the great air base at Thule, Greenland, which guards America against Russian jets.

It is dark in Thule now, five months later, and the *Atka* has left for Antarctica to scout for oil, coal and uranium in that distant, frozen continent.

What sort of ship is this that the U. S. Navy assigns, within a few months, first to breaking through the ice curtain between us and Russia, then to exploring the polar seas at the world's opposite end?

The *Atka* is one of our country's *Wind*-class icebreakers. They are America's first true ocean-going icebreakers. They were designed by the Coast Guard to replace heavy-duty cutters which, although good enough for ice work in the Great Lakes and inland waterways, were not sturdy enough to battle heavy Arctic and Antarctic ice. During World War II, when our forces had to operate freely in frozen waters off Greenland's northeast coast, where the Nazis were trying to establish weather stations, four of these 269-foot, 5,500-ton icebreakers were built.

Soon after the Polar Bear flag was raised on the *Atka* and we sailed out of Boston Navy Yard last summer, I learned one unforgettable characteristic of these ships: They roll!

It isn't a mild, well-behaved roll; it's an abandoned roll. The *Atka* was designed to roll 87 degrees without capsizing. Luckily, this design feature was not put to test on our voyage. A 30-degree roll was enough for me. The cycle, from side to side, was repeated every eight seconds, with first the port main-deck scuppers dipping into the sea, then the starboard.

Floats Like a Bowl; Rolls Like a Barrel

Stubby and wide-beamed, the *Atka* has a rounded hull. She has practically no keel or vertical hull surfaces such as give ordinary ships stability. There is a good reason for this. The pressure of

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This is polar ice—10 feet thick. The *Atka* rides up and cracks the ice by sheer weight.

In the Land of the Midnight Sun scientists balloon-launch rockets from an icebreaker.

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Mt. Dundas is the landmark of Thule harbor. Even in summer, an icebreaker must open

heavy, solid pack ice closing in would crush an ordinary hull. The *Atka's* bowl-like hull is designed to rise with the ice pressure; it is pushed up by the ice instead of being crushed. As a result, when the icebreaker is sailing in the trough, with the swell coming in from the side, she rolls like a barrel cut in half lengthwise.

ALL IS NOT ICE for an icebreaker. In open water, due to her rounded hull and lack of stabilizers, the *Atka* rolls and pitches wildly.

The first icebreaking that I saw done was in Melville Bay, off Greenland below Cape York. Capt. Glen Jacobsen, who now is skippering the *Atka* in Antarctic waters, regarded this as simply a practice run. I was on the bridge when we hit the ice.

As we approached, it looked like a vast field of drifted snow ahead of us, with open channels of blue water snaking through it. The *Atka's* high bow hit the edge of the ice at about 10 knots (we were not using full power because of a damaged blower on one of the diesel-electric units).

Plowing Through a Sea of Sherbet

There was a squashing sound as we slid through, not slackening speed. I had braced myself, but there was no jolt.

This was rotten floe ice, slush and

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the way for tankers that bring in fuel for our Arctic-based jet fighters and big bombers.

puddle ice. I saw puddles of melted snow and ice here and there on the floes. Plowing through it seemed as simple as moving a spoon through vanilla sherbet. But there was ice underneath, as I soon found out.

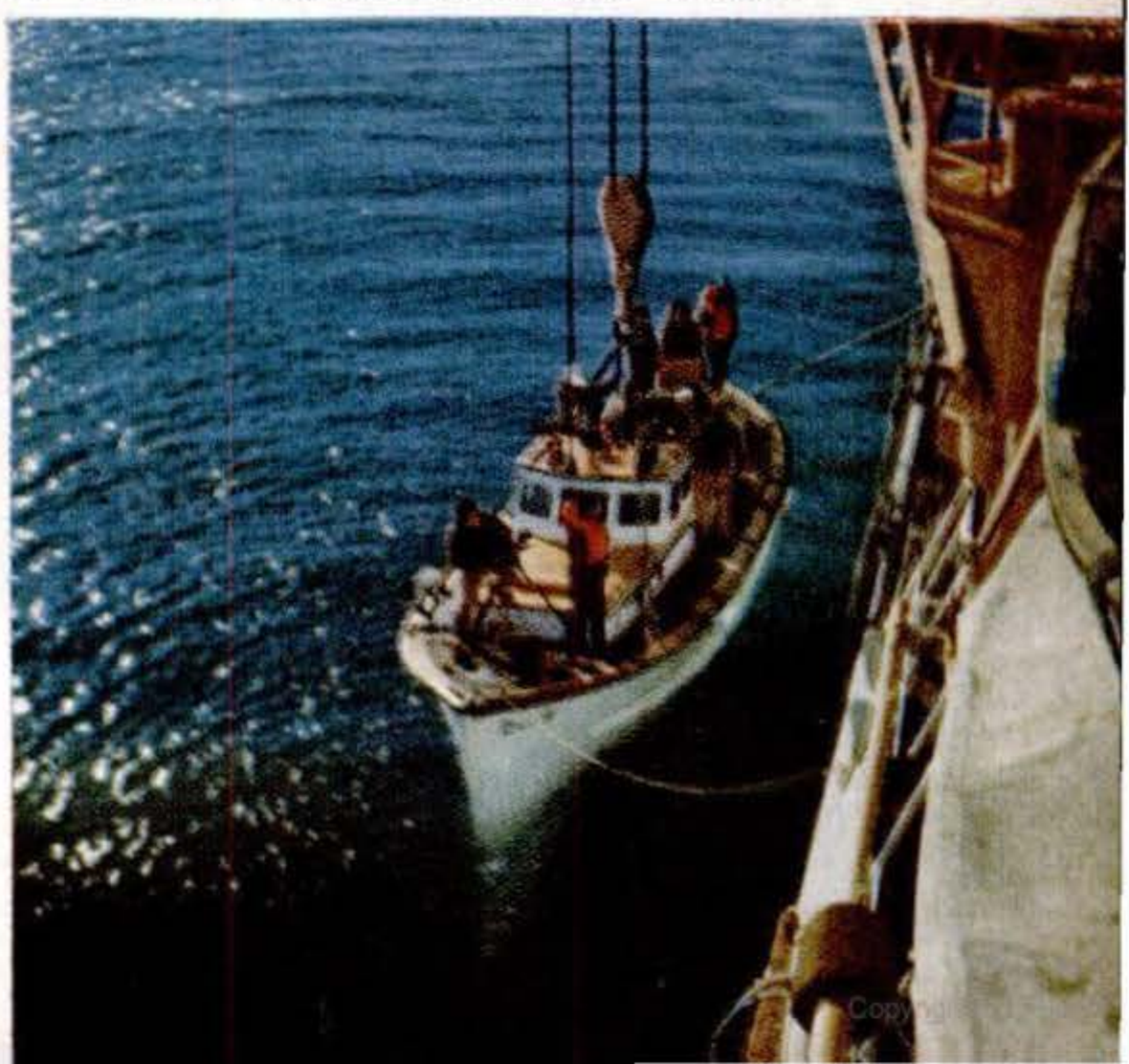
The ship suddenly seemed to stagger. We had hit an ice ridge. There was a crunching sound. Big slabs of blue-green ice broke off, heaved up on each side of our bow and toppled over. The ice was at least four feet thick.

"This is sissy ice," the officer who was conning the ship told me. "It's soft, but even then you've got to respect it. It couldn't do any harm to our thick hull, but an ordinary ship would never get through it without hull damage."

We were plowing through smoothly again. As we hit more solidly frozen areas, cracks opened up for hundreds of feet to each side. We entered a lake of open water. The conning officer changed his course slightly, evidently to hit the ice head-on.

That, I learned later, is one of the cardinal rules of icebreaking: Respect ice, but don't coddle it. If, for instance, you hit the ice a glancing blow, it might swing your stern out into the ice and

GREENLAND CRUISER goes over the side. Its hull has extra sheathing so that it can operate among ice floes to explore uncharted waters.



Here giant icebergs are born. This is a helicopter view of Moltke Glacier, near Thule.

break your propeller blades—the bugaboo of ice navigators.

I noticed another thing. I no longer had to do a constant balancing act with my legs to counteract the roll of the ship. There was no roll. The sea swell was completely tranquilized by the ice floes.

After several hours I hit the bunk, although I hated to leave the bridge because it was going to be a bright, beautiful and sunny night.

But the *Atka* received radio orders during the night to leave the Melville Bay ice and proceed to Thule to pull out a tanker that was aground in the harbor. We entered North Star Bay early on the morning of Friday, July 30, snaking our way through small icebergs, demolishing rotten ice floes in our path, and anchored in the shadow of Mt. Dundas. By then the tide had freed the Navy tanker, *Mission of San Luis Rey*. Still we were ordered to stand by to lead her out of the harbor through bergs and ice into the open sea.

Opening a path through ice for transports, freighters and tankers, all of which are thin-hulled, is one of the important jobs of icebreakers, not only in the Arctic, but in the Great Lakes and many inland

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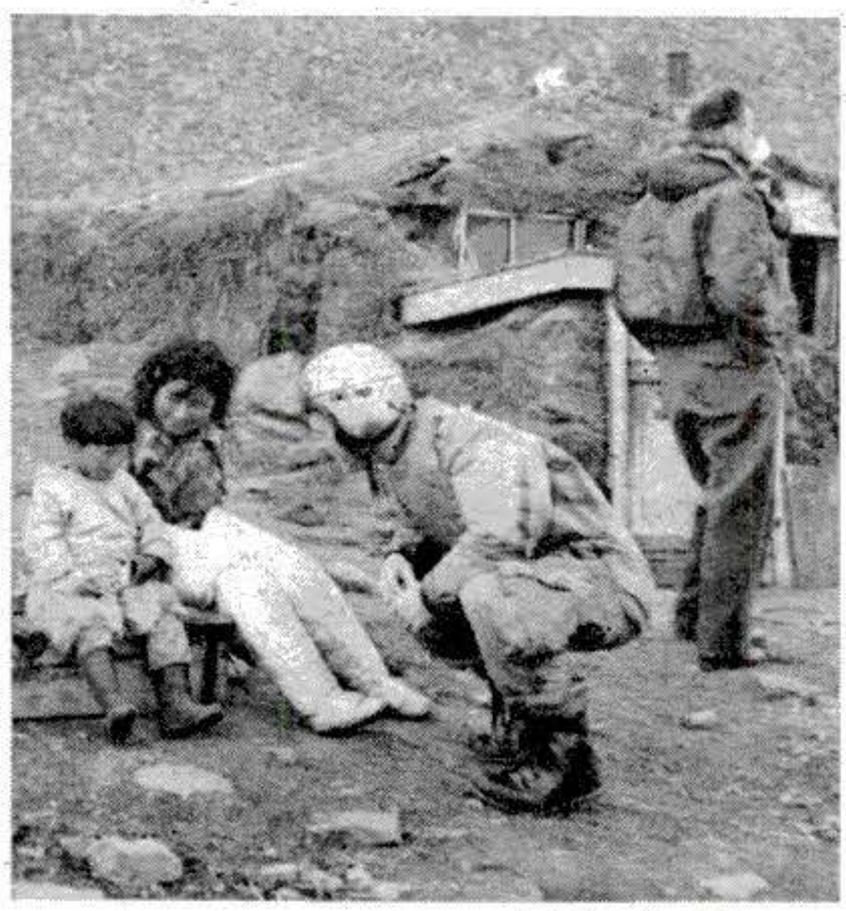
waterways that freeze over heavily during the winter.

On this occasion, there was very little ice, so the *Mission of San Luis Rey* followed half a mile behind us. If there had been a heavier ice coverage, such as we encountered in Melville Bay, she would have been much closer so that the ice we broke and pushed aside wouldn't close in again in front of her bow.

In leading a convoy of supply ships through heavy ice, two icebreakers are often used. The second one straightens out any bends in the leader's path through the ice. If a convoy ship gets caught in a closing channel, this second breaker may maneuver out of line, approach the beset vessel from the side and break the closed-in ice across her bow. In other cases, it is only necessary for the icebreaker to position itself in front of the stuck craft's bow and go full speed ahead, enabling the ship to follow in the wake of the propeller wash.



TO ESKIMO WOMAN of North Greenland, this pilot, dressed in crash helmet and survival suit, is just a funny man who gives candy bars to her child.

Convoy work is one reason why icebreakers must be relatively short and broad of beam. The first makes it maneuverable in ice that has been broken; the second opens up a wide channel for the following ships.

If a supply ship or transport becomes completely disabled and has to be towed through the ice, she is snubbed right into a V-shaped notch in the stern of the icebreaker.

After our return to Thule on the *Atka* I transferred to the U. S. Coast Guard icebreaker *Eastwind*, Capt. George H. Bowerman commanding. In his cabin one day he showed me a chunk of jagged metal and asked, "Know what this is?"

I shook my head.

"That's 1⅝-inch high-tensile steel. It's what our hull is made of, to above the water line."

I was properly impressed.

"Know where this came from?"

Again I shook my head.

"From the hull of the *Eastwind*. We got into some really hard ice one year. Ripped a 10-foot square of this stuff right out of the hull."

The captain then explained that tearing a hole in an icebreaker isn't as serious as it may seem. The entire hull covers a series of watertight compartments in which fresh water and fuel is carried. Tear a hole in one compartment and you simply exchange fuel or fresh water for sea water.

The greatest danger in breaking solid ice, I learned, is to the propellers. The broken ice has no place to go except into the track of the ship. At the stern it has a tendency to go underneath the ship and lodge around the propellers. You either slow down in time or break some blades.

"On our run to Alert [a weather station only 450 miles from the North Pole]," Capt. Bowerman related, "there is always the chance of getting stuck fast in pack ice, so fast that even blasting won't open up a crack. Then you just wait, hoping for a wind to shift the ice pack. If the right wind doesn't come along, you may sit there till summer."

"But in that case," I asked, "isn't there a chance that the ice might build up high enough for the pressure to crush even the hull of an icebreaker?"

"That's what we often wonder," said Capt. Bowerman, knocking the dottle from his pipe. END

NEXT MONTH: Mr. Johansen will continue his narrative of icebreaking in the Arctic. Watch for his article entitled "The Frozen Frontier Americans Must Guard."

Please turn the page for pictures of antics in the Arctic

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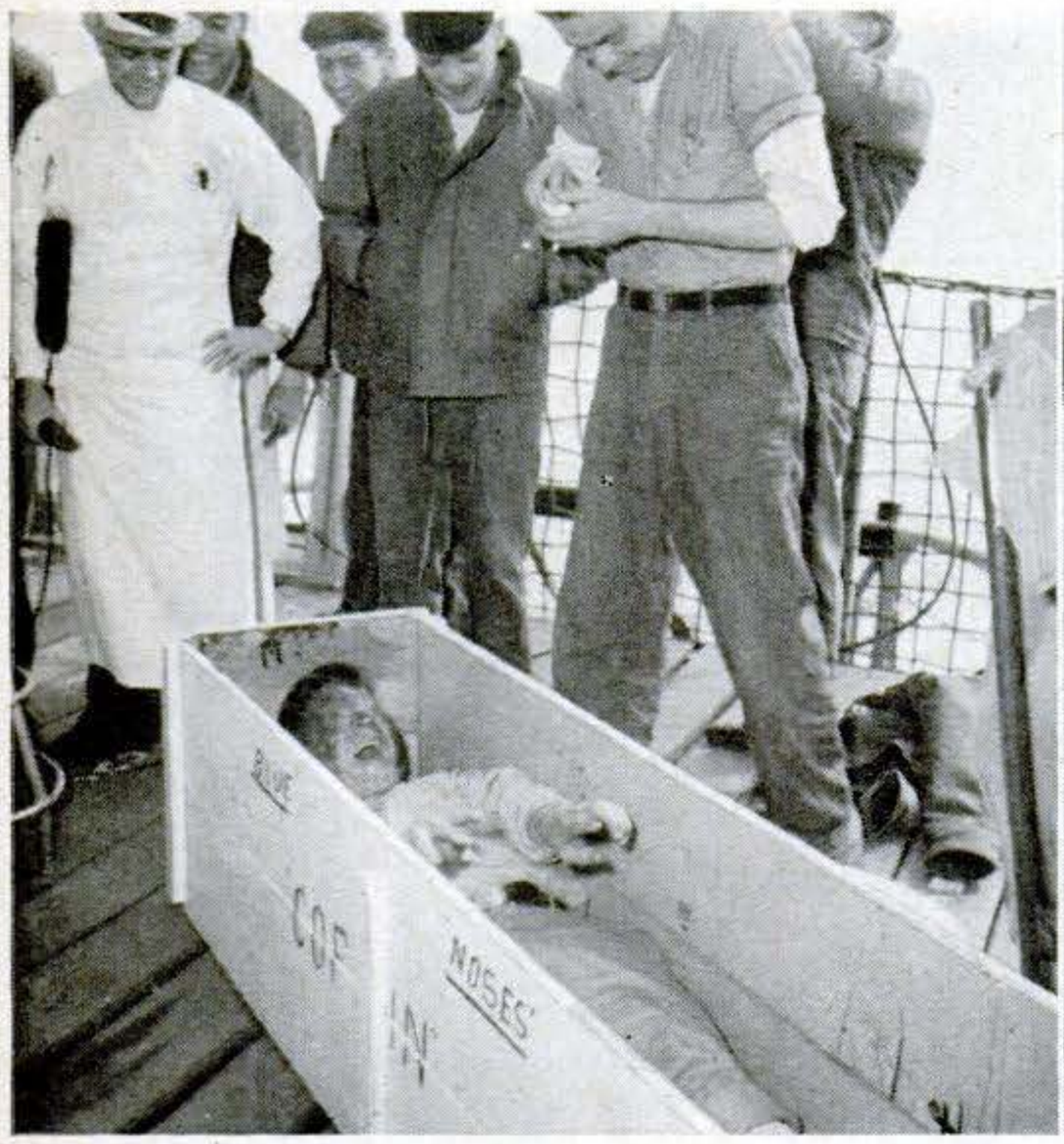
KING NEPTUNE and his royal court assemble on the icebreaker's flight deck. Arctic ceremony is similar to that suffered by Polliwogs crossing the equator to become Shellbacks.

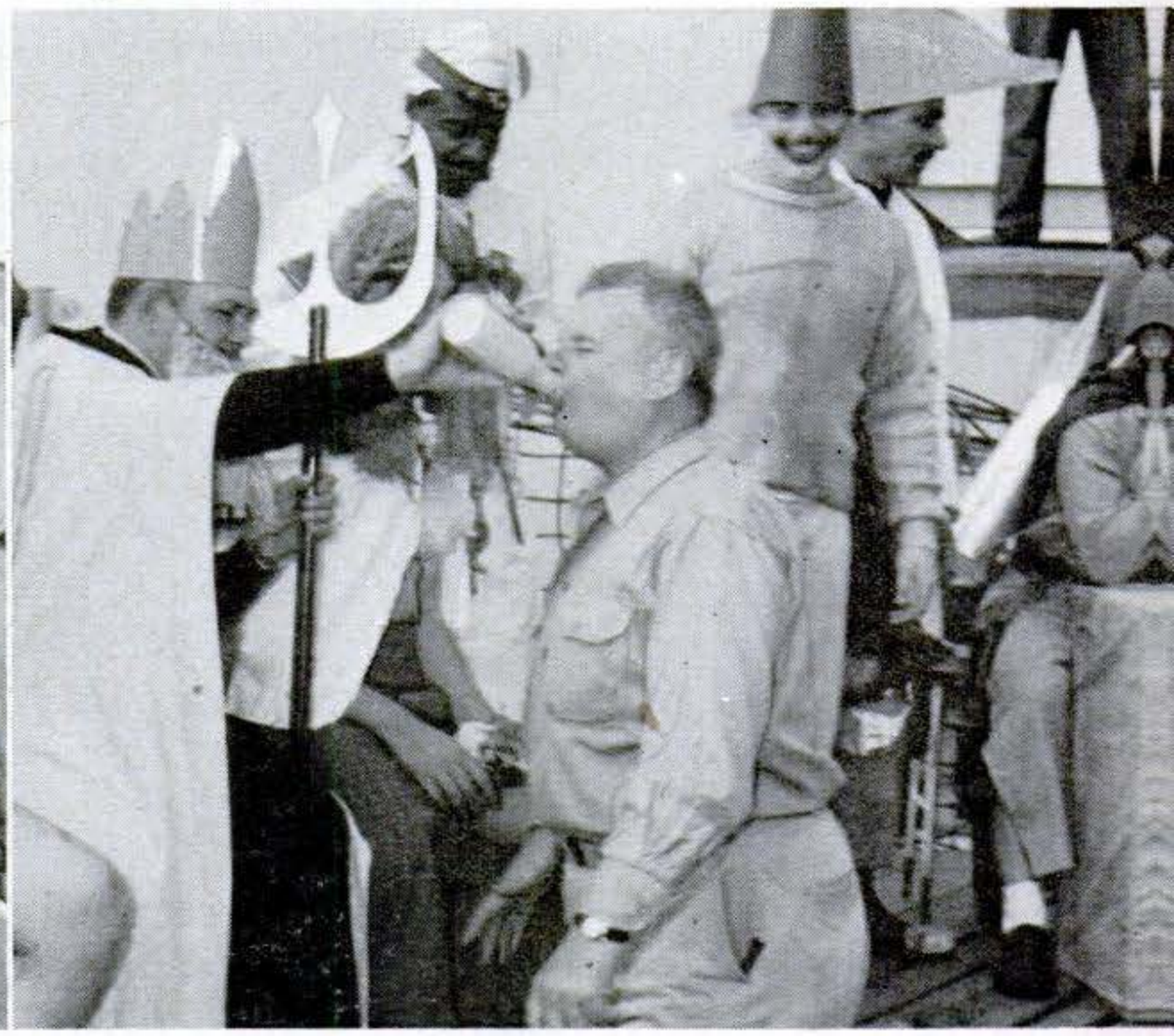
How You Become a Polar Bear

WHEN you enter the Domain of the Polar Bear, Ruler of the Arctic, you will be asked if you are a horrid ice worm (a person who has not crossed the Arctic Circle in a ship). Unless you can prove otherwise, your nose will be

INTO THE COFFIN goes a victim. A raw egg is being cracked to plop into his open mouth.



ALL BLUE NOSES are found guilty. Here King Neptune himself administers Polar Bear milk.



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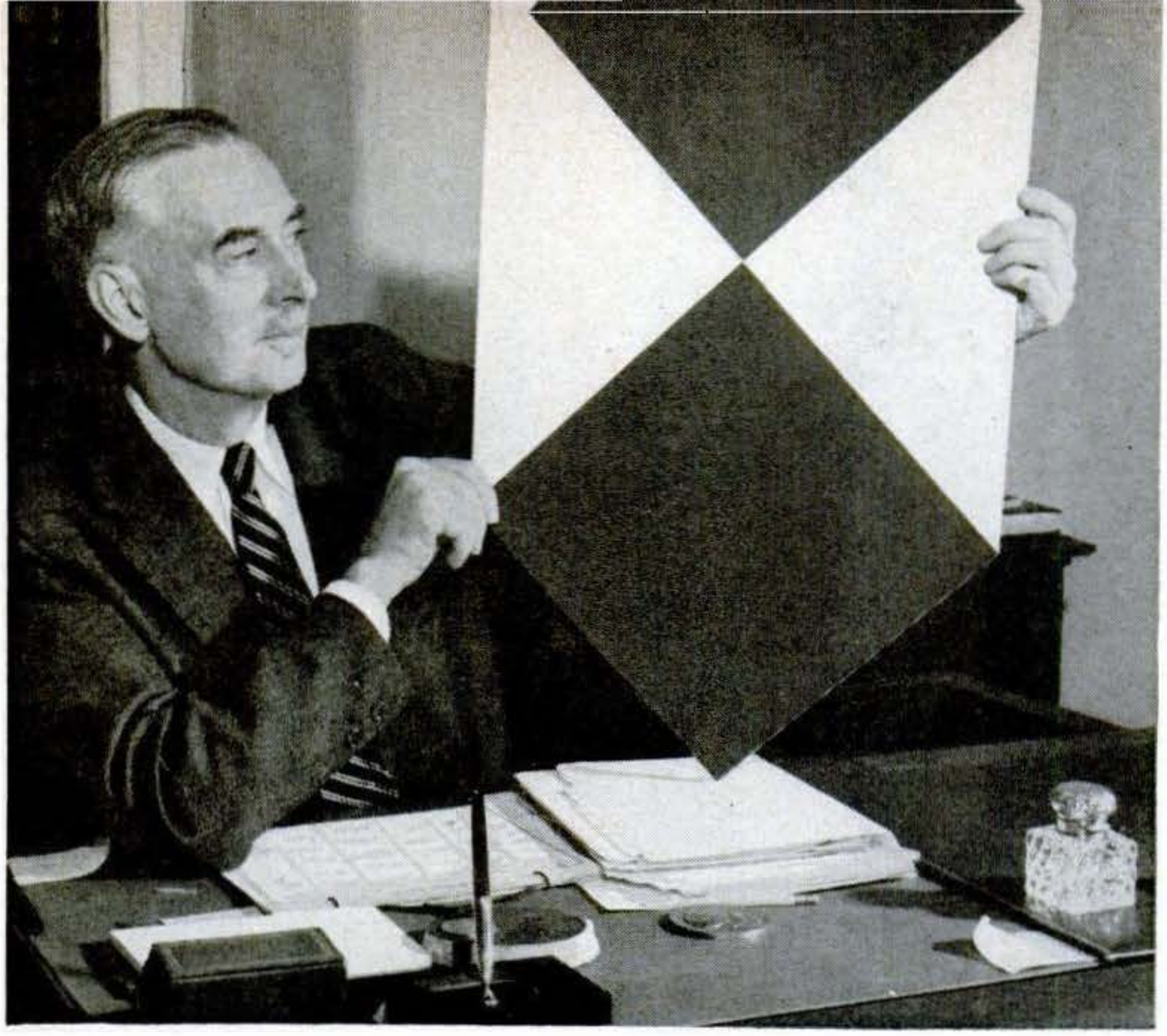
"I'M A TIN-CAN SAILOR!" shouts a Blue Nose officer who previously served on a destroyer.

painted blue. This mark of infamy you will wear until the ship crosses the Circle. It can be removed only by enduring a rugged shipboard initiation, such as this one photographed aboard the U.S. Navy icebreaker *Atka*.

A GLOPPY SHAMPOO and facial—then a paddling run—and the Blue Nose is a Polar Bear.

QUEEN NEPTUNE substantiates her claim to the glamorous title: "Siren of the Arctic."

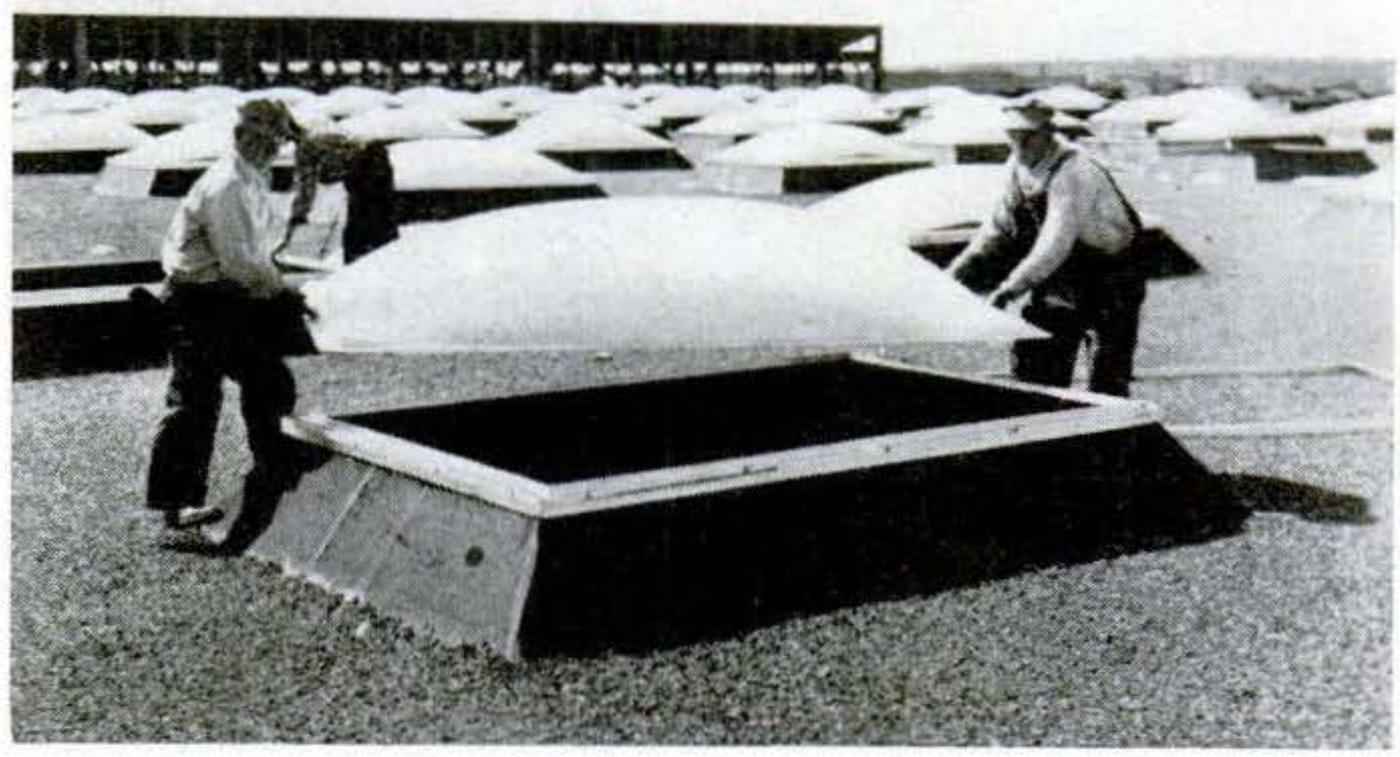


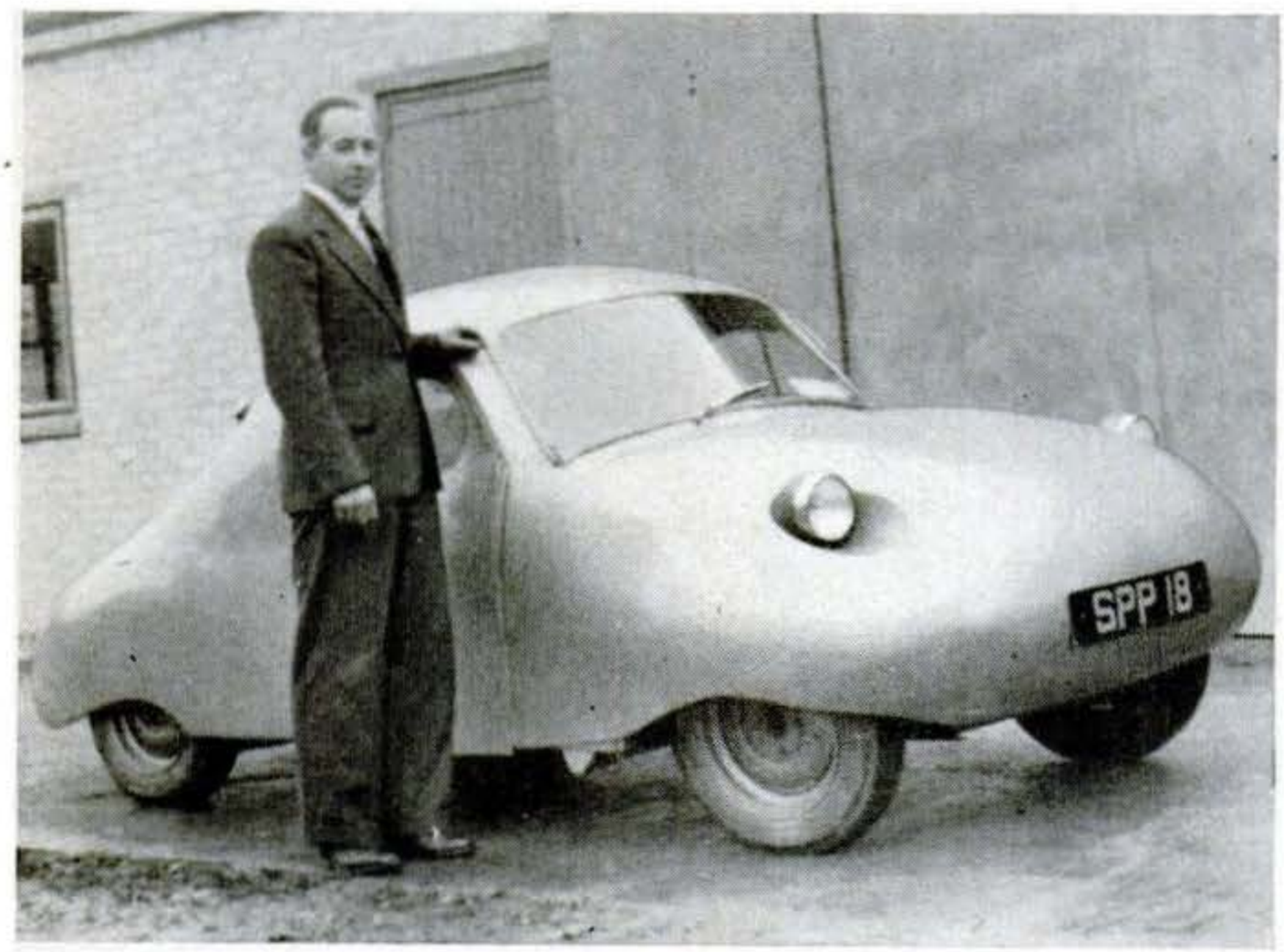
Roof Markers Will Warn Off Enemy Planes

THIS blue-and-white symbol will protect priceless cultural objects in wartime. Most nations—including Russia—have approved it. It will be painted on the roofs of museums and historic shrines to mark them as out-of-bounds for enemy bombers. At left, Dr. Leonard Carmichael of the Smithsonian Institution holds a shield displaying the new "bombs off" sign.

Plastic Bubbles Light Five-Acre Warehouse

LOOKING like huge biscuits rising all over the five-acre roof of a new Signal Corps depot in Tobyhanna, Pa., the plastic bubbles at right are skylights for the only windows in the huge warehouse. Wasco Flashing Co. 87 Fawcett St., Cambridge, Mass., which makes them, says rain will keep them clean enough.





Motorcycle Engine Runs Plastic Car

A REAR-MOUNTED single-cylinder motorcycle engine under its bumperless plastic body gives the British car at left its punch. The tiny beetle-shaped car can scuttle along at better than 75 miles an hour and can cover 50 miles with only one gallon of gasoline in the tank. An 868-pound midget with big-car independent suspension and hydraulic brakes, the Atom sells in the United Kingdom for $777.

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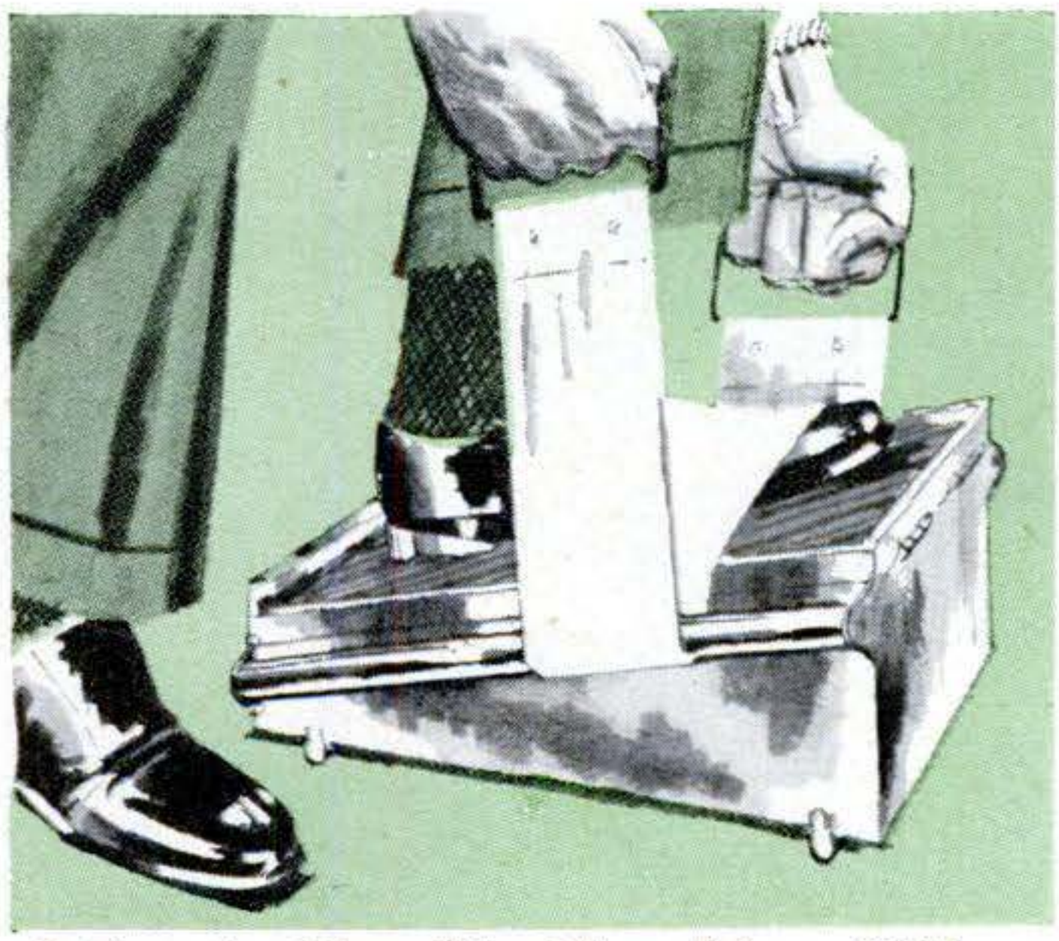
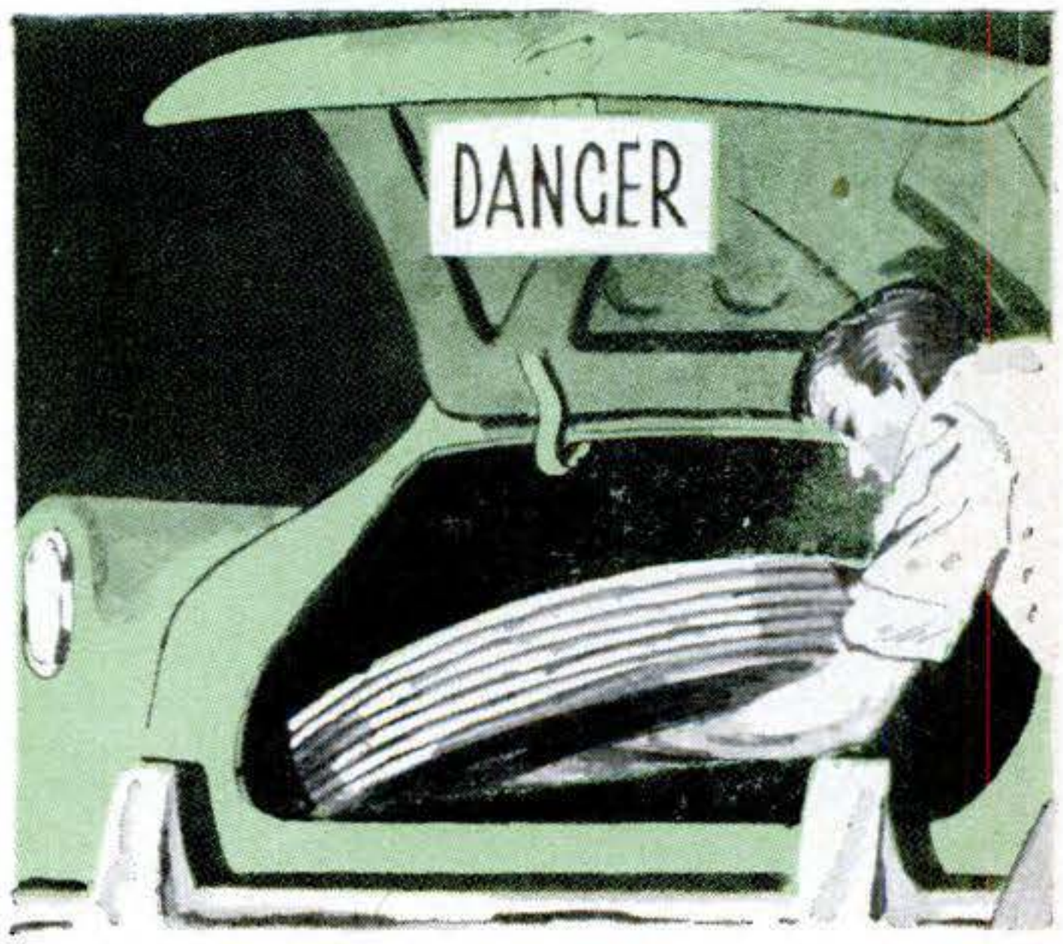
New Ideas

FROM THE INVENTORS

1 Pack to Double as Sled. A soldier or camper who had to trek over ice or snow would be able to tow this haversack behind him. When on dry ground, he'd sling it on his back knapsack-fashion. The bottom half of the tote-or-tow carrier would be made of lightweight metal stamped in the shape of a toboggan shell; the upper part would be constructed like a conventional pack board. The halves could also be used separately.



2 Box to Simplify Shoeshine. With an outfit like this, you could give your own shoes the full bootblack treatment. A polishing cloth with clip-on handles would lace under rollers attached to the box. Pulling up on the handles would whip the cloth over your shoe tops. All equipment could be stored under the hinged lid.



3 Raised Sign to Protect Car. You wouldn't have to worry about standing clear of tail lights when you changed a tire if your car had an elevated warning sign hinged inside the trunk lid. Raised above most road obstructions, the light-reflecting letters would give oncoming drivers extra warning of a stalled car ahead.

Please turn the page for more new ideas

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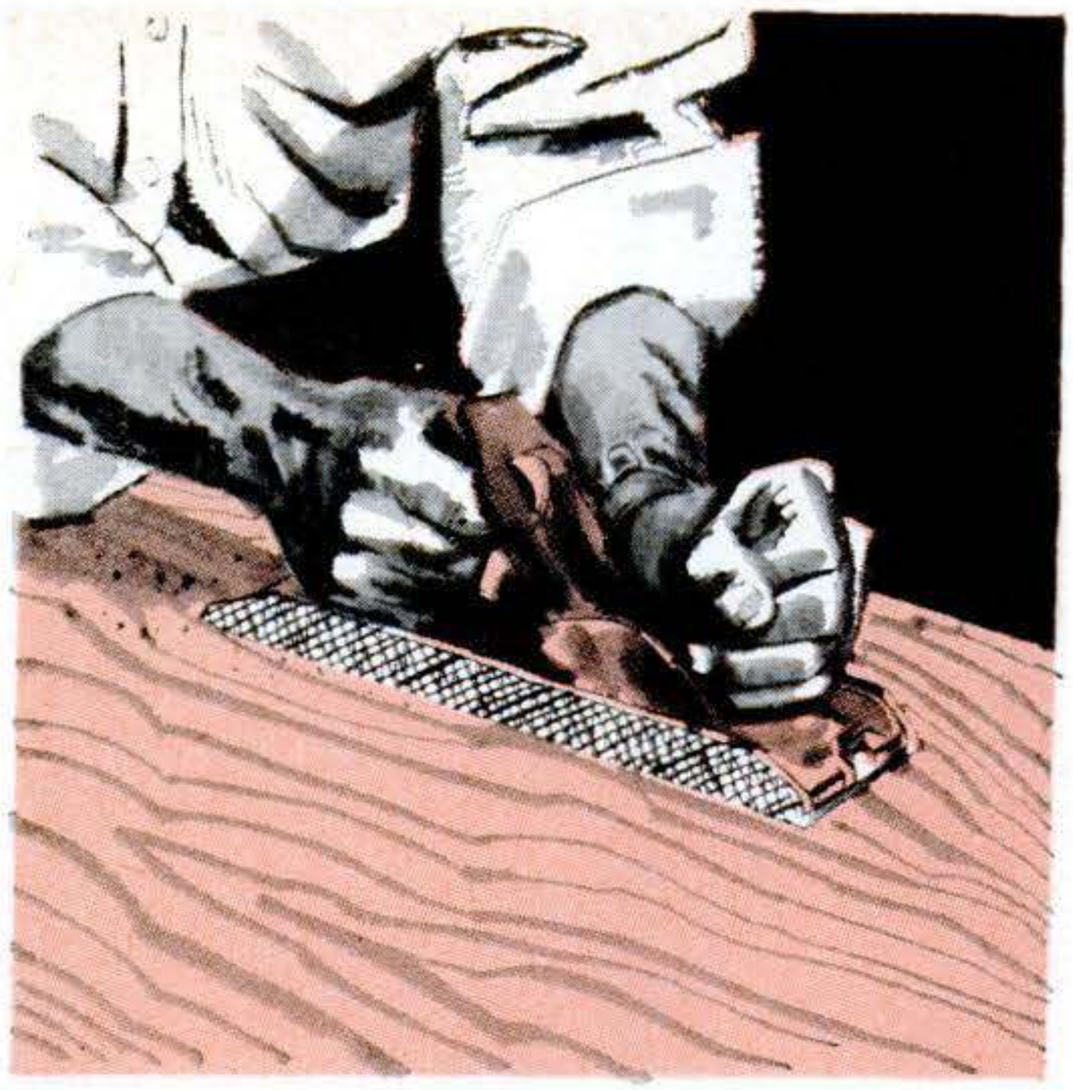
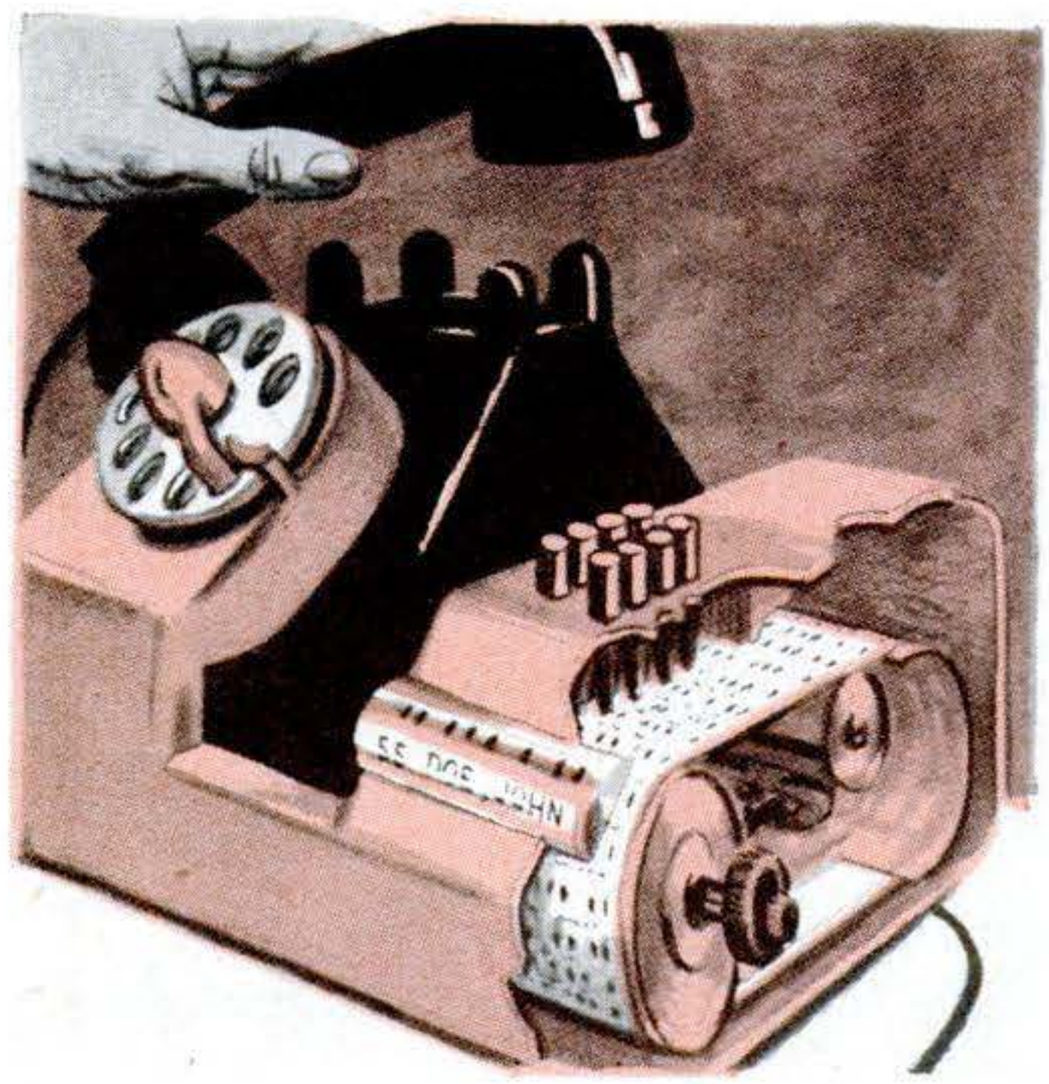
MORE New Ideas from the Inventors



5 File to Clip on Plane. You could get a good grip and exert uniform pressure on a file that snapped over the sole of a plane. Since the bottom and side of this attachment would form a right angle, it would be useful for filing inside corners. The shoe would also protect a stored plane.



4 Liquid to Brace Buildings. "Thixotropic" liquids that will not penetrate soil might be used to reinforce sagging foundations or raise those that have started to lean. This inventor suggests sinking a shovel-like boot along the foundation, then pumping in the liquid. Pressure would pack the earth, make it act like the wall of a hydraulic cylinder. The fluid would then be pumped out, replaced with concrete.

6 Directory to Dial Your Phone. To make a call with the help of this automatic directory and phone dialer, you would only have to turn to the name of the person you want to call. A tape punched like a player-piano roll would then guide a motor-driven finger which would twirl your regular phone dial. Built-in punch keys would permit you to code a new number onto the tape each time you added a name.

U.S. patents on these inventions have been granted to: 1. J. Fanelli, U.S. Army; 2. C. de Gonzalez, Caracas, Venezuela; 3. T. Mead, Wilmette, Ill.; 4. H. Lorenz, Berlin-Tempelhof, Germany; 5. J. Bennett, North Bend, Wash.; 6. J. Kilburg, Burlingame, Calif.

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A secret Government need for strange liquid metal sets off a

Mysterious Boom in Mercury Mining

"LIQUID SILVER," as Aristotle called mercury 2,300 years ago, is here being poured from one of the 76-pound flasks in which it is marketed. A good ore yields 10 pounds of mercury to the ton of rock.

BENEATH A MOUNTAIN, more than half a mile from the surface, the miner below opens up a vein of cinnabar, rich in mercury. Most of the world's supply of the liquid metal comes from this gaudy red ore.

THE curious liquid metal that rises in your thermometer when you are sick, and tells you how hot or cold the day is before you venture out, is making mysterious news. Uncle Sam is gobbling up mercury at the fastest rate in the metal's long, romantic history. No official will say why.

One guess is that mercury is being absorbed in the rapidly expanding production of guided missiles.

Whatever the reason, the extraordinary thirst of Government buyers for mercury, a liquid that is heavier than lead and won't wet anything dunked in it, has sent the metal's price surging up

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to $325 for a 76-pound flask. Four years ago, such a flask fetched only $70.

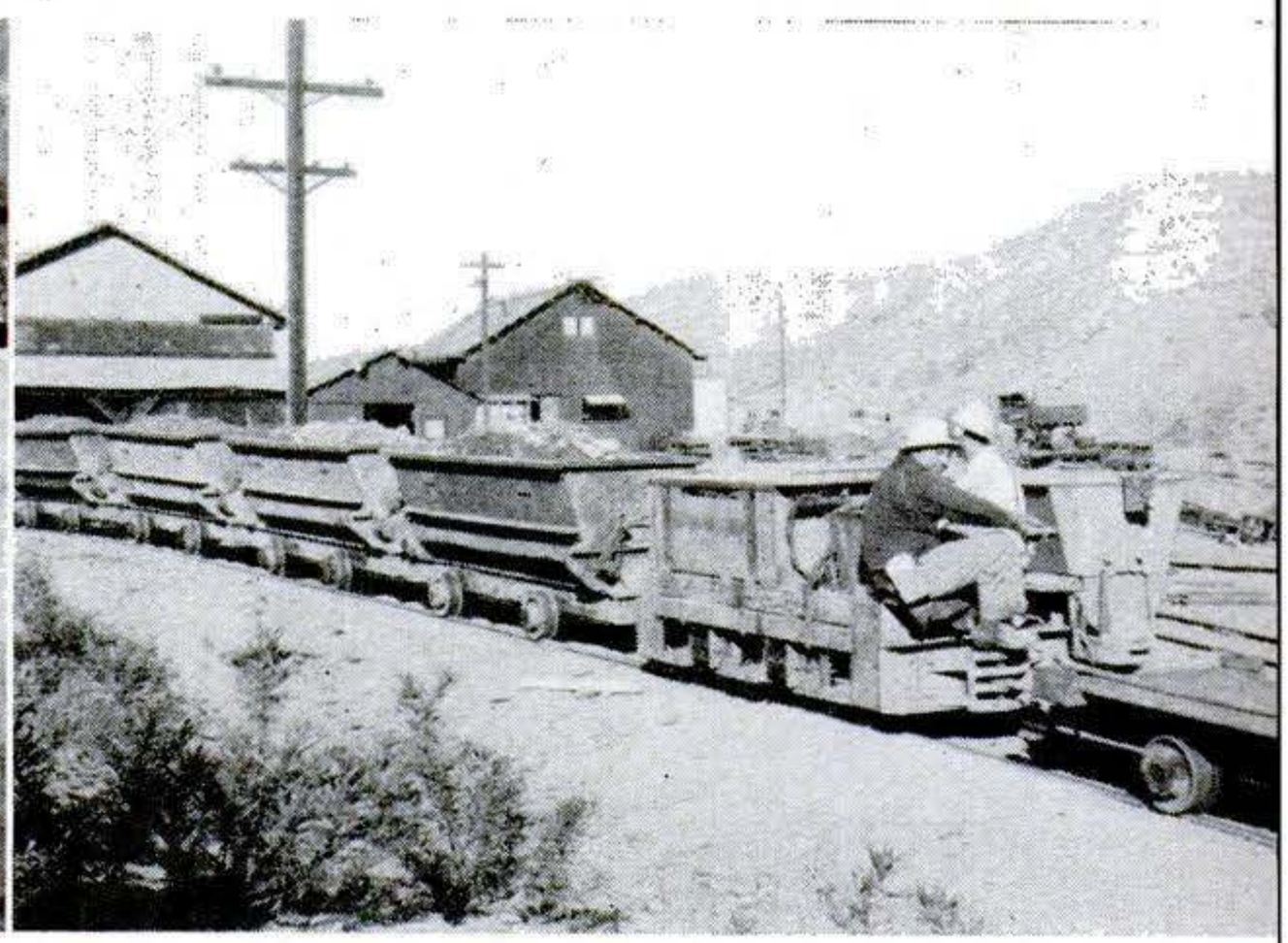
Today's historically high price has naturally led U.S. mercury mines, most of which are in California, to expand production briskly. It has also led owners of long-idle mines to reopen them, and encouraged prospectors to hunt in abandoned diggings for mercury that leaked out of ancient smelting furnaces.

Mercury, liquid from 38 degrees Fahrenheit below zero to 675 degrees above zero, comes from a red ore called cinnabar. The ore is usually crushed into small chunks, which are then melted. Mercury is extracted as vapor, then condensed, purified and bottled.

Cinnabar is dug out of sweltering passages often hundreds of feet below ground. A typical operation, shown in the accompanying photos, is that of the New Idria Mining & Chemical Co., near San Francisco. New Idria, biggest U.S. mercury mine, contributes 500 flasks a month to the mounting, secret U.S. stockpile—*Andrew R. Boone.*

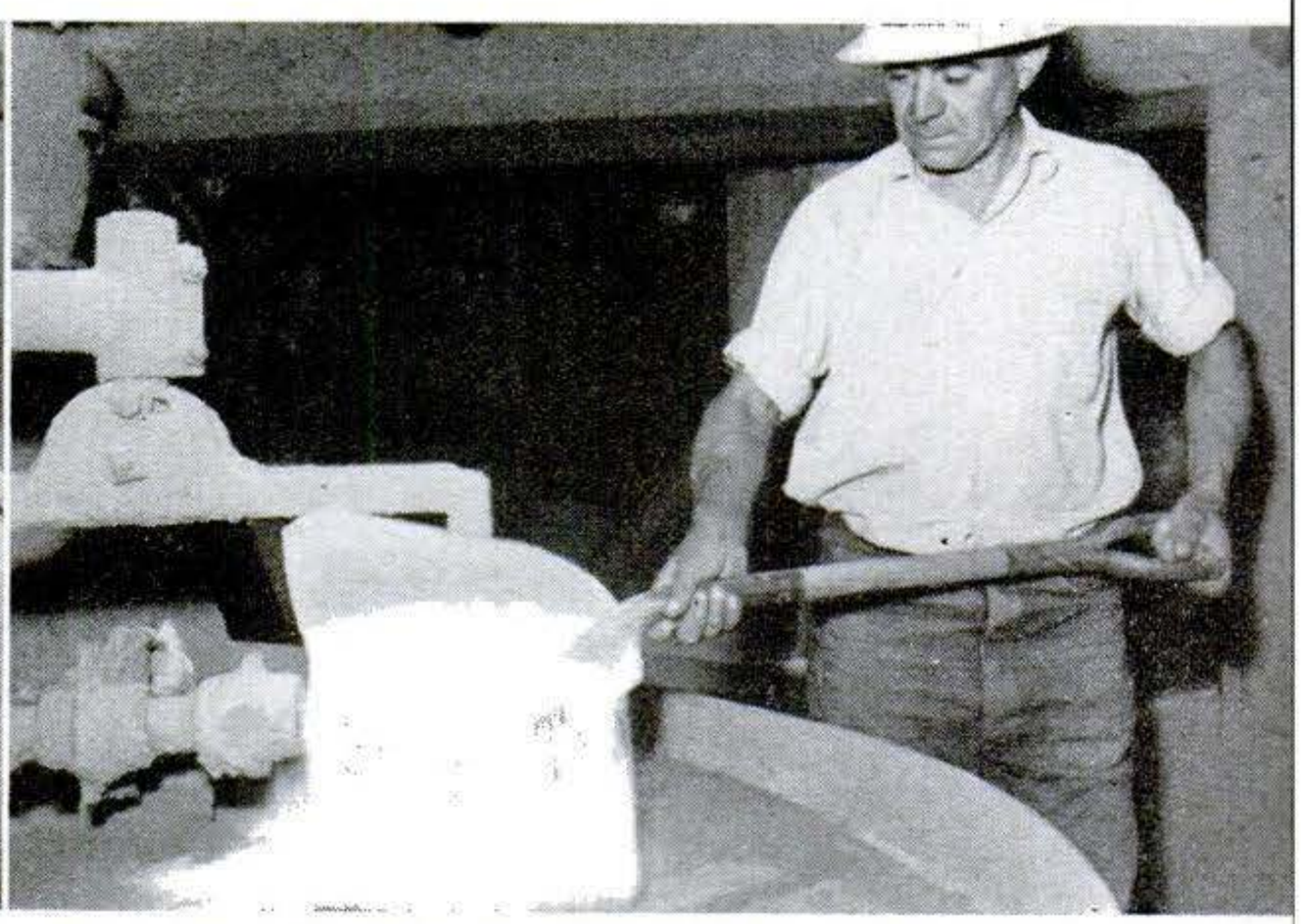
Mercury Mining: From Rock to Bottle

1 PREPARING TO BLAST: As in most mining, men air-drive steel liners into ore-bearing rock, then set explosives in the bores. Mucking machines pull away the loose cinnabar rock.



2 LOADED ORE TRAIN, filled on levels far below, makes one of its several daily trips to the mill along a narrow-gauge track. Each little car carries 2½ tons of ore.

3 ON AN ENDLESS BELT, ore fresh from the mine rises to a crusher, where it is broken into chunks no bigger than two inches. The workman above is picking out odd bits of debris.



4 MERCURY FROM CONDENSERS (top of right-hand page), mixed with impurities, looks like mud. It is spread on a warm, circular table (above) and hot lime is shoveled onto it.

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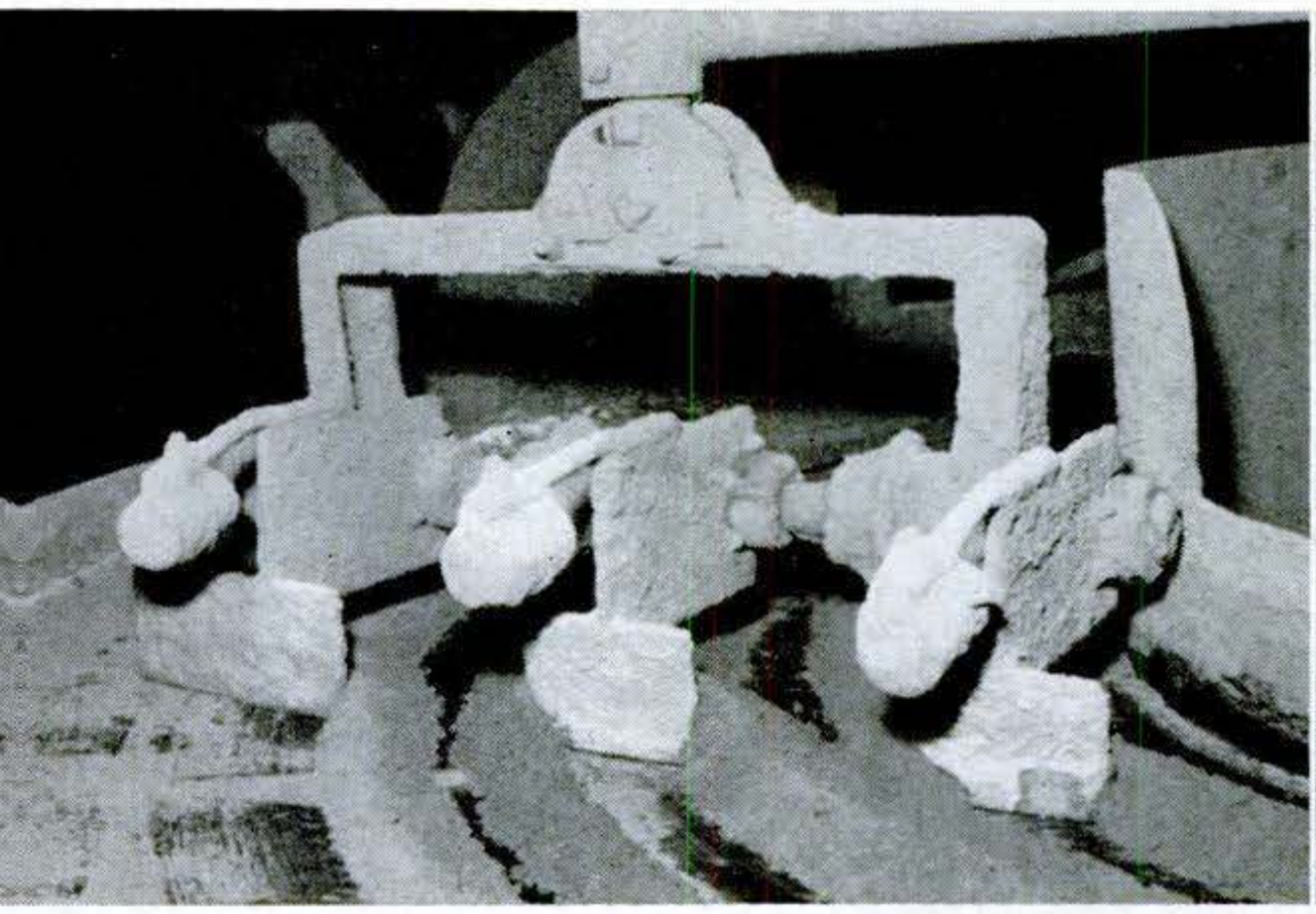
AS BUSINESS EXPANDS, a new condensing system rises at New Idria. Vapor from ore cooked in rotary kilns at temperatures up to 1,500 degrees condenses in the big tubes at right above and in the redwood tank at left, and produces tiny droplets of mercury. New Idria opened the first of its 20 miles of tunnels in 1853; it's now the nation's biggest mercury mine.



5 THREE SETS OF HOES, circling the round table twice a minute, mix lime and "mud." The lime dries the mixture and removes nitric acid. Free mercury then slides into a trap.

6 AFTER A FINAL WASH to remove zinc and remaining impurities, mercury is ready to be poured into flasks and shipped. This mine has produced 500,000 flasks since 1853. END

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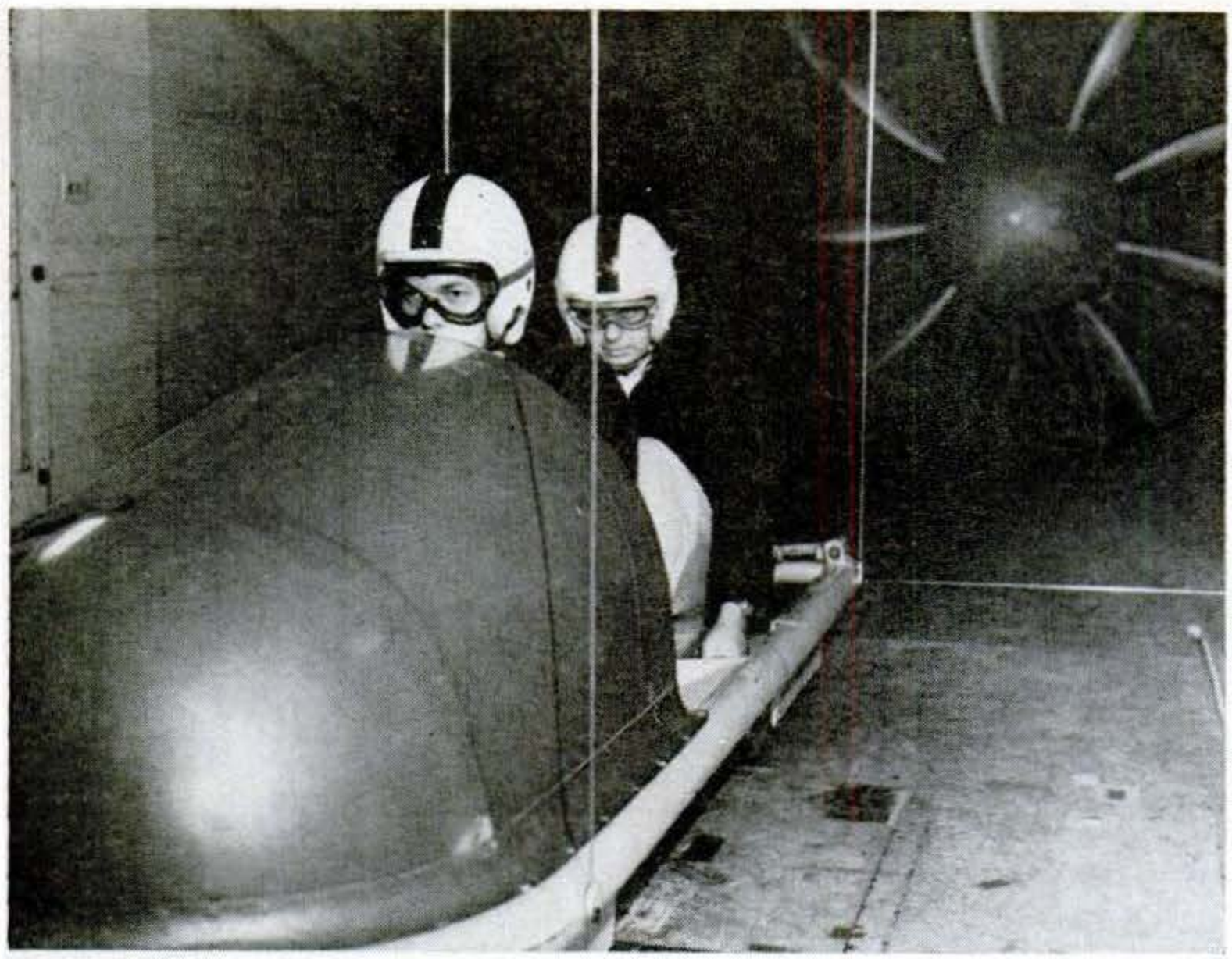
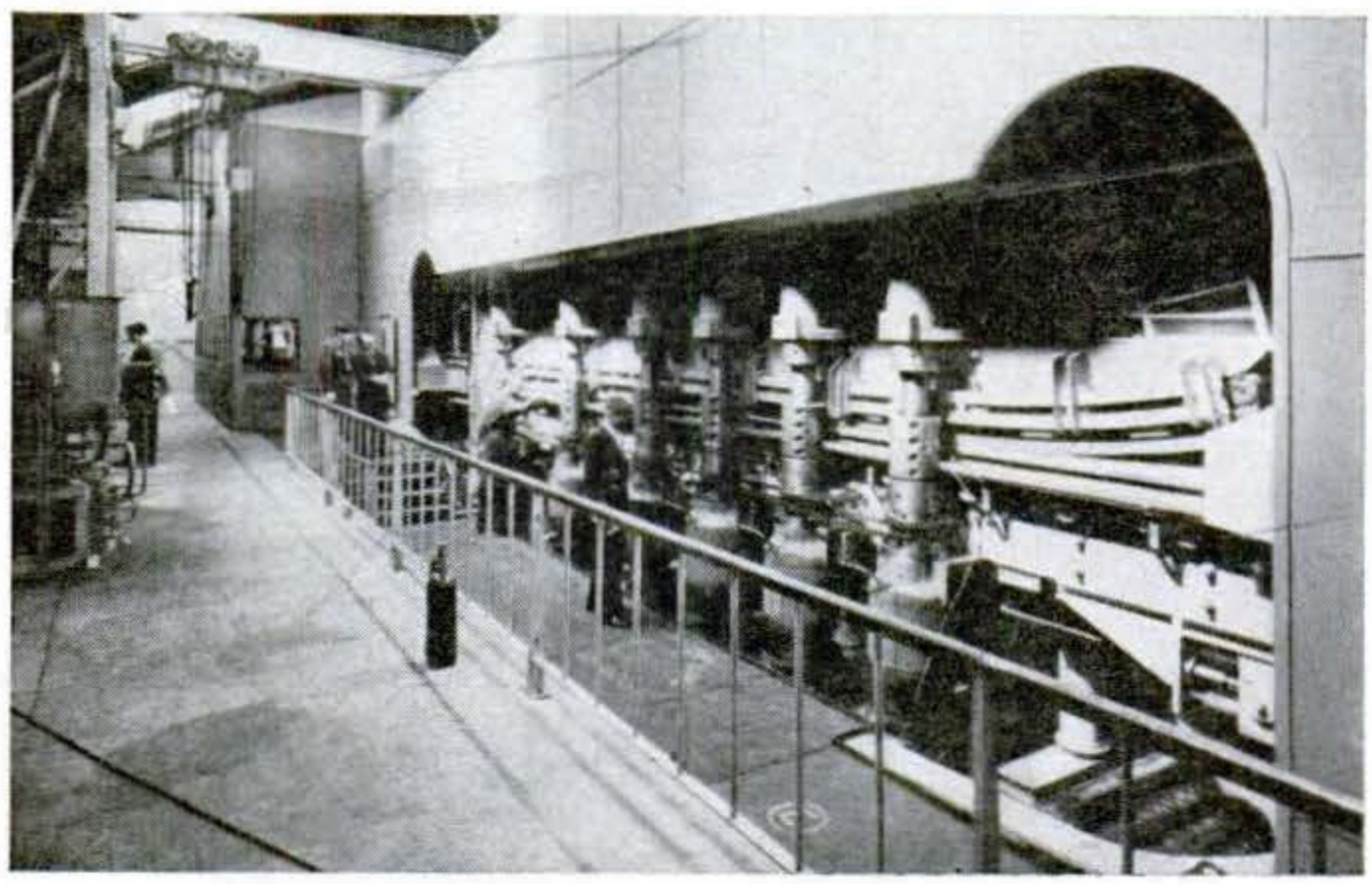


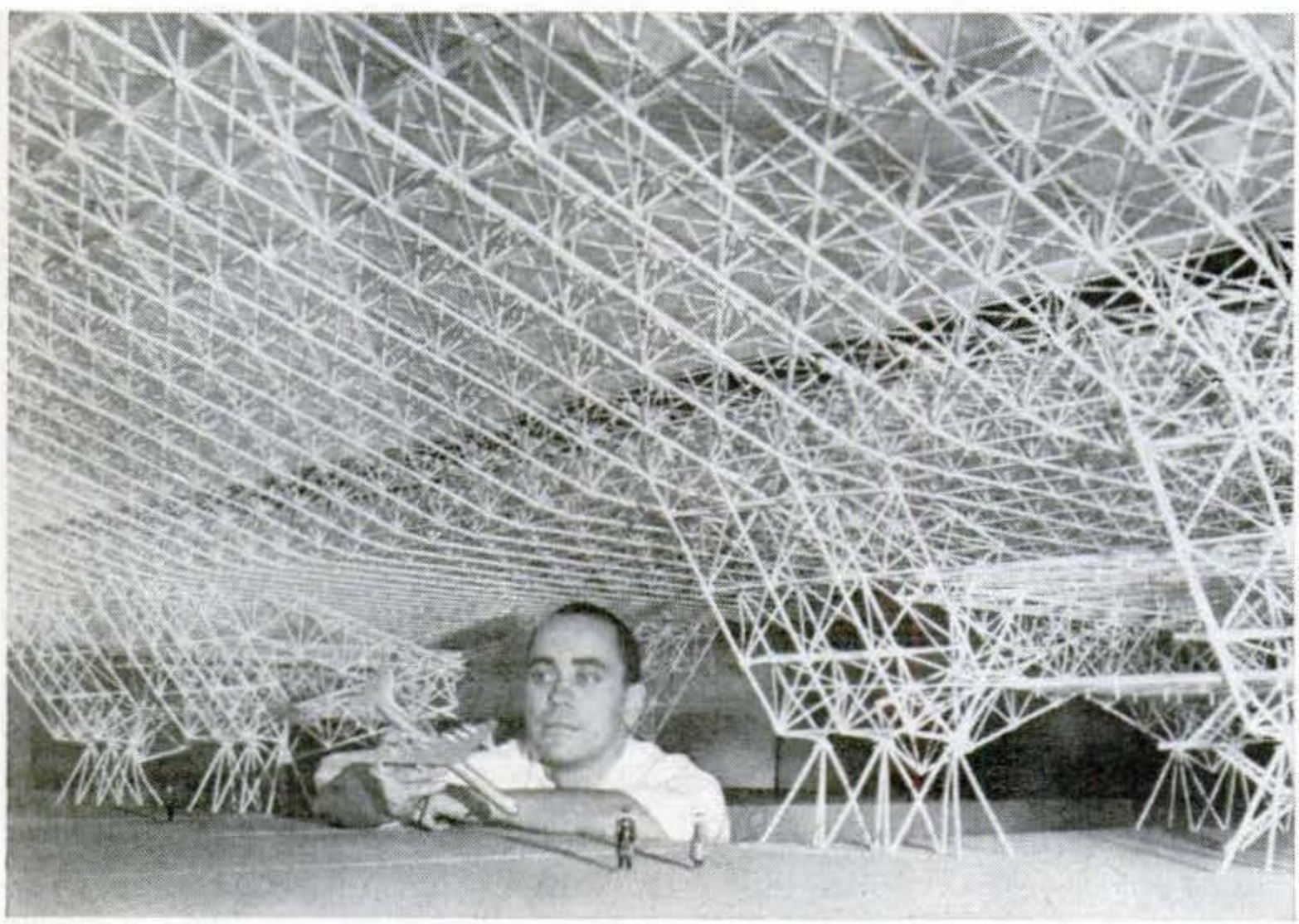
Bobsled Makes Dry Run to Test Streamlining

THE bobsled at left is going nowhere fast. Anchored in a wind tunnel at New York University, it's taking the 60-mile-an-hour blast of the big tunnel prop for a check on its streamlining. The crew—bobsled veterans Dr. Arthur Tyler (front) and Edgar Seymour, both from Rochester, N. Y.—hope to enter their sled in the 1956 Olympics.

Big Machine Makes Board from Waste

THE huge press at right takes in wood waste at one end and spews out at the other end a four-foot-wide sheet of solid chip board, good for walls, doors, floors and furniture. The British-developed Bartrev Board, said to be cheaper than other chip boards, is expected to be made in the U.S. soon on presses like this one.





Lacy Framework Forms a Hangar

DROPPING bombs on a plane hangar like this one would be like poking holes in a spider web. A model of a proposed Air Force structure that would consist wholly of interchangeable parts, it was designed at the Illinois Institute of Technology.

It folds like an accordion to go up fast, and comes down just as easily.

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Imperial's 'Honest Lines' Delighted Wilbur Shaw

The famous Indianapolis racer found this last car he drove "very refreshing." Here are his comments from the wheel.

By Kenneth Wylie

Wilbur Shaw

Wilbur Shaw, the Indianapolis Speedway's president and manager, was killed in an airplane crash last October 31. He was on his way home from Detroit, where he had driven the new Imperial. Mr. Shaw's reports on new cars had been featured in this magazine for several years. Kenneth Wylie, Midwestern editor, had spent the day with him at the Chrysler proving ground. This is Wylie's report of the opinions that Shaw expressed while driving the Imperial.

IT WAS a gusty, cold morning when we drove out to the Chrysler proving ground near Chelsea, Mich., where Wilbur Shaw was to drive the Chrysler Corporation's new luxury car. Our first stop

COMING OUT of the test loop, the Imperial sedan hit the first straightaway "like a bomb," the speedometer showing 115 m.p.h. Even at this speed, performance was silent. Shaw rounded the 4.7-mile track in about three minutes.

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Rugged shake strip didn't faze the Imperial, even at 70 miles an hour. Reasons: new, hefty

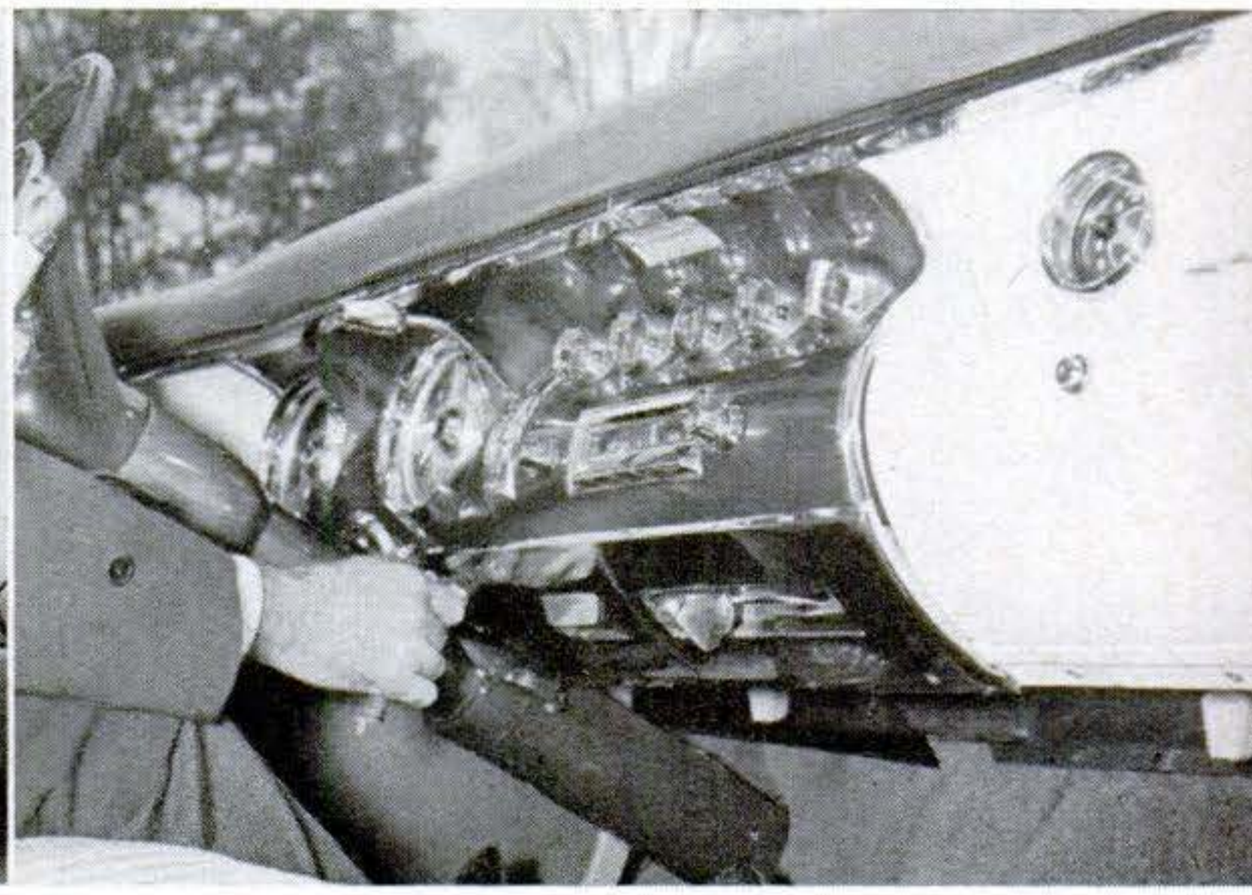
was the ground's big garage. Shaw leaped out the minute we were through the automatic doors. He had caught a glimpse of two Imperials, a metallic-red and black sedan; a metallic-green and white Newport hardtop coupe.

"Looks like something from those Italian idea cars got through to the assembly line," he said as he examined the open honeycomb grille, the low, sloping hood and the crowned fenders. Running his hand over the character line molded into the cars' fenders and side panels, he commented, "That's honest design for a change, not just stuck on the outside."

He nudged open the big trunk lid, flipped up by torsion-bar hinges, looked over the flock carpet lining. Both gas-filler pipe and spare tire are on the same side, giving greater storage space. "Big enough for a maharajah, bag and baggage," Shaw remarked.

Next he noted the name plate, nodding approvingly at the omission of "Chrysler" in the Imperial's name. "That's good," he said. "When people buy a luxury car they don't want it to have the same name as one that sells for $2,800 or $3,000."

"EXTENDED VIEW" is Chrysler's name for its version of the wrap-around windshield. It curves at both the top and the bottom. Shaw especially liked the forward-sloping pillars.



PLUSH-RECESSED INSTRUMENTS and controls give crash-pad protection to front seats. Another feature is a device that prevents starting unless the shift lever is in neutral.

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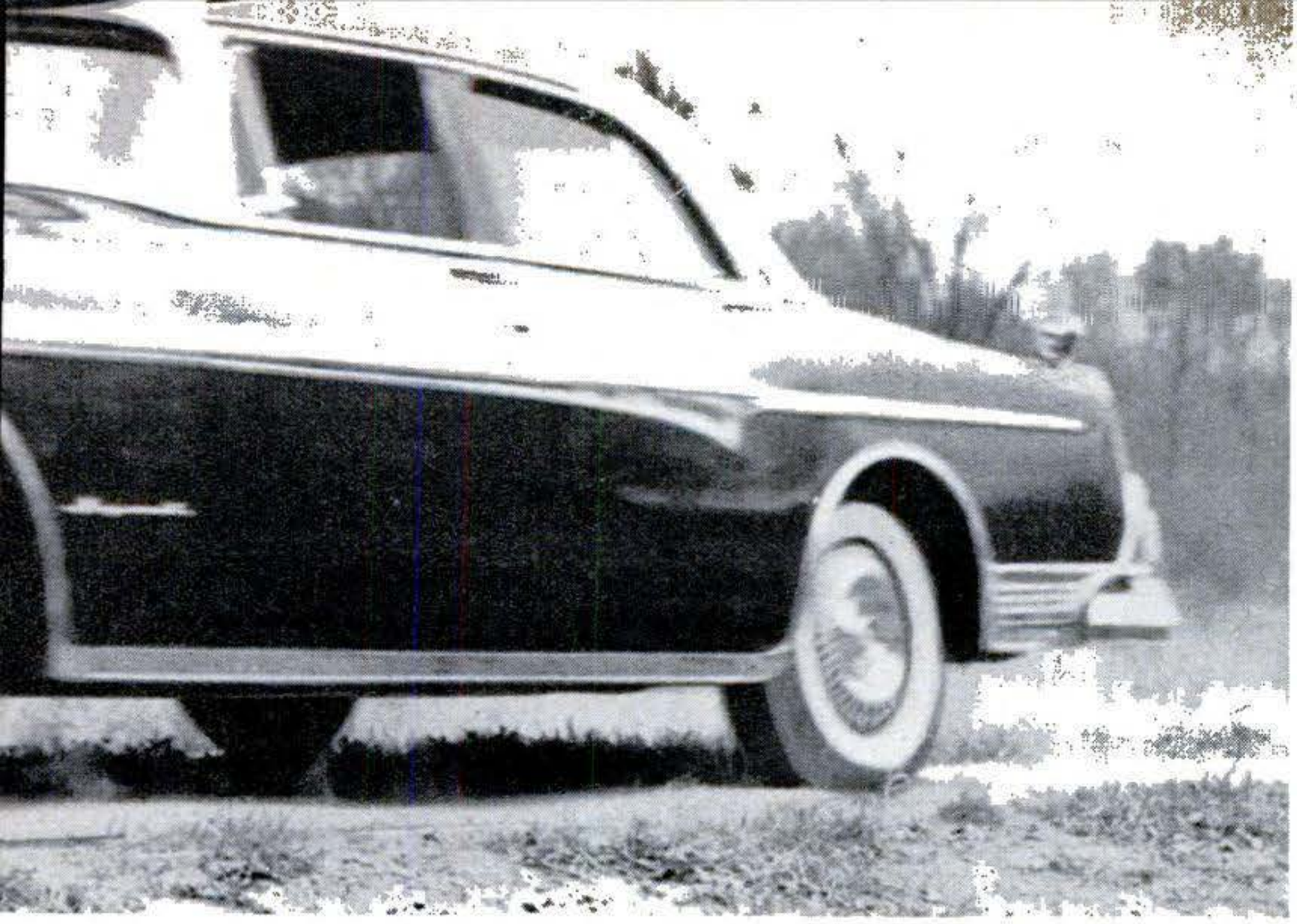


frame; more body mounts; new spring and shock-absorber mounts.

GUN-SIGHT TAIL LIGHTS were lifted from Chrysler idea cars. Rear lens is a standard red. The forward nose of the nacelle is an amber button that throws light to aid driver in night parking.

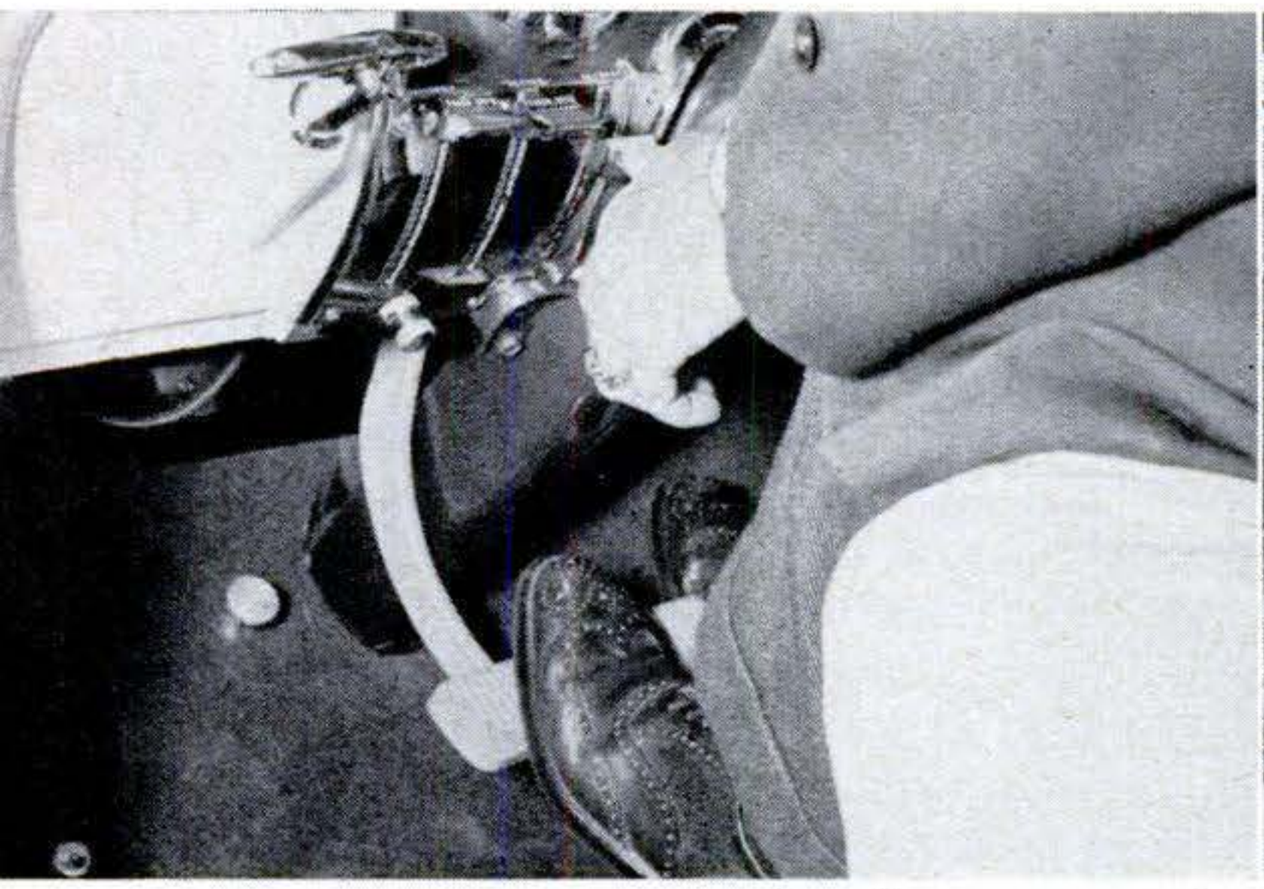
A Chrysler engineer with us pointed out that more than the name had been changed on the Imperial. It is independently designed from the ground up.

After a minute of going over the dash controls, Wilbur Shaw, auto racer since 1918, was as tickled as a kid in a five-and-dime.

"Look where the PowerFlite lever is," he said. "Up on the dash. It may be a little tough for short guys like me to reach at first. But getting it down off the steering column will cut out all that train of linkage to the torque-converter housing. It will be easier and a lot cheaper to fix."

He looked over the instrument panel again. "All car makers could build more safety into their product. I like that crash pad on the dash. And look how all the control knobs are recessed under the padded overhang at the top. Now what we need is padding for the back-seat drivers too."

With this he twisted around, fingering the backs of the front seats. He smiled. There were cushioned bolsters across the top, and hassocks on the floor. Both items are new for 1955. Easing out of the



"EVEN THE HAND BRAKE has been put on the dash now," Shaw remarked. Sliding heater and forced-air controls are located next to the brake, at lower left of the steering column.

GETTING UNDER THE HOOD, Shaw praised the heater-ventilator complex mounted in a plastic chassis against the engine well. Under his right cuff are power-brake components.

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TIGHT-FLOWING LINES of the '55 Imperial can be traced to an Italian-American ancestor, the K-310 (top photo), designed by Chrysler and built in Italy. In lower photo the Imperial (right) is compared with the Chrysler, showing differences in grille, bumper and trim.

garage we headed for Chrysler's 4.7-mile test loop.

On the track, we idled along for a moment while Shaw got the feel of the 18½-foot car. Then he let it out. There was little sound, not even wind noise. As we hit 100 m.p.h. (speedometer reading) on the first turn, he took his hands off the wheel. "This track does all the work," he said, grinning. "All you have to do is work the gas and be a good driver."

We hit the first straightaway at 105, and from then on Shaw went for the limit. We broke 115 m.p.h. on the dial, and he seemed satisfied. I think there was more play left in the gas pedal, but we were almost back to our starting point. Time for the course: three minutes plus.

We headed off the fancy roads and back into the torture course of Chrysler's proving ground. Pot holes and deep ruts whipped by as Shaw turned to look around with a twinkle in his eye. There wasn't a creak and hardly a jostle.

Up ahead, the shake strip hove into view. This consists of two parallel ribbons of wavy concrete with the wave crest in one opposite the valley in the other. A car running on the strip is alternately pounded and twisted.

But even at 70, there was no body noise, no sense of strain. Our companion from the engineering department explained that the answer lay in four general improvements:

- A stiffer, heavier frame.
- An increased number of body-to-frame mounts (18 instead of 16).
- An improved suspension, achieved by mounting rear springs 5.06 inches farther apart, and by shifting front shock absorbers inside the front coil springs.
- A combination of such factors as 4½-inch-wider front wheel track; Chrysler's coaxial power steering (PSM, May '54, p. 89); a symmetrical idler-arm steering linkage to keep linkage and suspension from fighting each other; and the highest roll center of any American car.

After two more trips over the undulating concrete, we headed for the hills.

Waiting to Be Tapped—400 Horsepower

We made two consecutive runs up a 17-percent dirt grade without any downshifting by the converter. There was power to spare in the 250-hp. engine. And company engineers say that the present Firepower V-8 can be pushed a long way farther than that—possibly to 400.

The extra push for '55 was worked into the cars as subtly as last year when power went from 180 hp. to 235. Throats in the four-barrel carb were stretched. Compression ratio was boosted from 7.5 to 8.5, and engine r.p.m. from 4,400 to 4,600. Duration of intake-valve lift was increased. Distributor timing was set two degrees earlier, and the automatic spark advance was increased.

These facts in hand, Shaw put down the big car's hood, noting the flush cowl ventilator that Chrysler still favors and the windshield wipers with their off-the-glass parking.

Someone mentioned the Imperial's automatic secondary throttle controls which cut in at high speed or during fast acceleration to throw fire out the car's dual exhausts.

Wilbur Shaw, the racing driver who once said, "Speed is my first freedom," smiled. We got into the car and drove slowly back to the garage. END

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Facts and Figures on the 1955 Cars

HOW the new cars shape up is shown arithmetically on the next two pages. How they did in '54, in sales, at the three-quarter pole is shown in the chart below. Some notes on the new specifications:

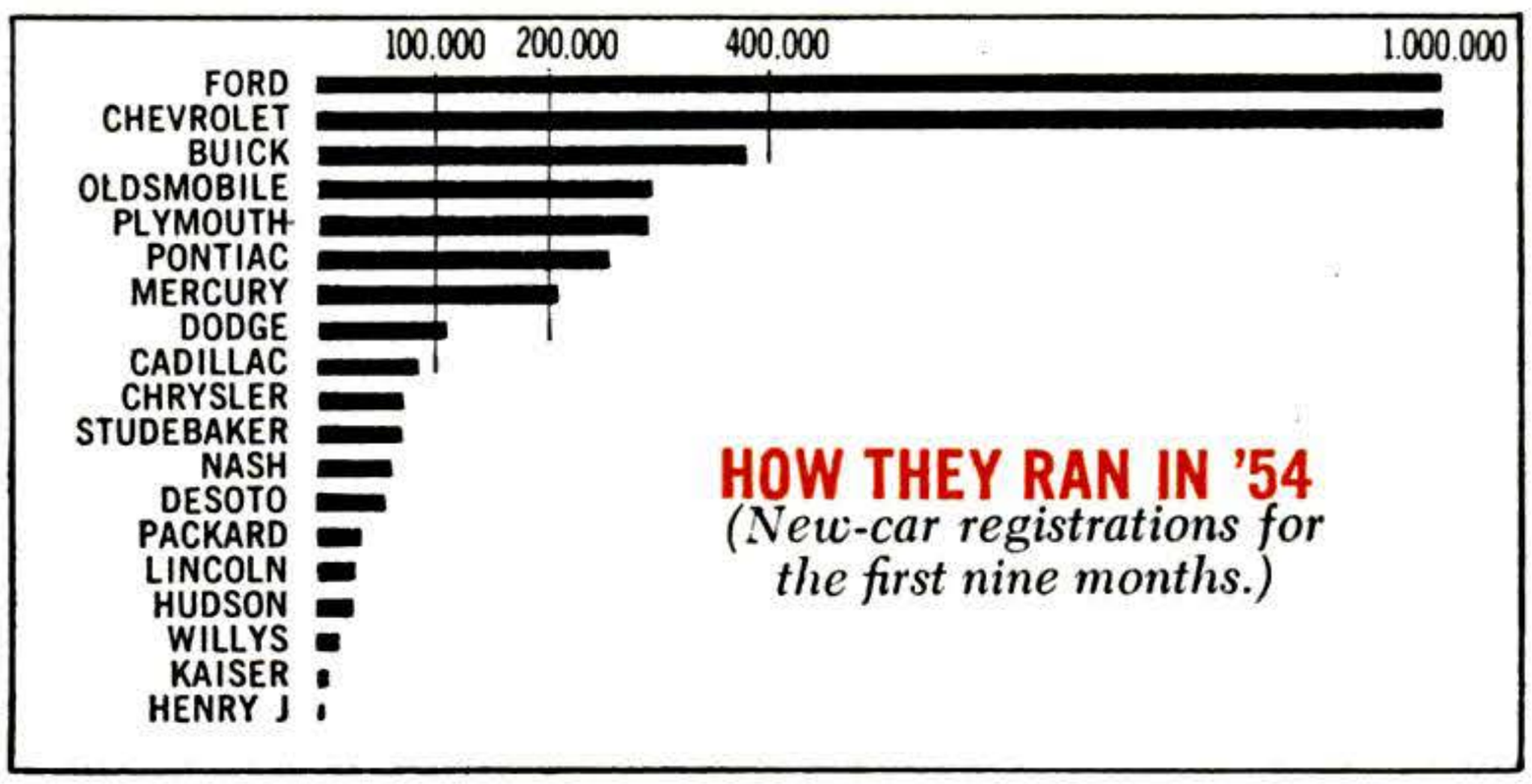
- ***Rated horsepower*** is up sharply for almost all makes. Average for the cars listed last year was 151.7 hp.; this year the average of the same cars is 178.4 hp.
- ***Torque,*** important in low-speed performance, and a measurement that many designers claim has been more of a goal than horsepower, is also higher for '55: an average 260 pounds-feet, compared with last year's 242. Note that the percentage gain is less than in power.
- ***Displacement*** is up somewhat. A few engines have grown much bigger; most have put on a few inches.
- ***Compression ratios*** are substantially higher, going from an average 7.5:1 to almost 8:1. This is a result of steadily climbing octane ratings of pump fuel, plus a design preoccupation with "mechanical octanes"—combustion-chamber and valve changes to ease an engine's fuel requirements. A number of stock '55 cars will have a 9:1 ratio. They do fine on present premium gas, but wartime (or even Korean-period) gasolines would reduce them to tears.
- ***Weight, length and wheelbase*** averages hold close to last year's. The typical 1955 car weighs a bit over 1¾ tons and needs just about 17½ feet of clear garage space.
- ***Pounds per horsepower,*** roughly a measure of acceleration capacity, reflects the increased muscle of the new engines. The average weight has dropped from a so-so 26.1 pounds to a flashy 20.8. Quite a few makes show up as hotter in this respect than many sports cars.
- ***Prices*** have generally inched up, though "compulsory options" are fewer. One trend not shown in the table is the continued breaking down of price-class distinctions. This year a buyer can widely obtain the fancy extras that, in the past, were mainly limited to gilt-edged cars. Buying a higher-priced car now doesn't mean getting new attributes so much as it does getting more of existing ones.

Weight totals given in the Box Score are for standard cars, with their basic transmissions but *without* gasoline (around 6.17 lb. a gal.); oil (6.7 lb.); or water (8.3 lb.).

Not every "line" or series is listed for every make, but an effort has been made to cover all that vary in other than trim.

Some specifications will depend on the body fitted to a car. Station wagons, for example, generally come with a numerically higher rear-axle ratio than would generally go with a particular engine and transmission. Tire sizes and overall length will also sometimes change by model. The figures listed are those for four-door sedans.

The only cars not listed are those not publicly unveiled by January 1. Unpublished information, however, indicates that they reflect the same trends in power, torque, displacement and fuel requirement.—*Frank Rowsome Jr.*



HOW THEY RAN IN '54
(New-car registrations for the first nine months.)

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Box Score Of '55 Cars

		ENGINE SPECIFICATIONS									
		TYPE OF ENGINE	MAXIMUM BRAKE HORSEPOWER AT WHAT ENGINE SPEED (Horsepower; R.P.M.)	MAXIMUM TORQUE AT WHAT ENGINE SPEED (Pounds-feet; R.P.M.)	BORE AND STROKE (Inches)	DISPLACEMENT (Cubic Inches)	COMPRESSION RATIO (to 1)	FUEL REQUIREMENT	COOLING-SYSTEM CAPACITY WITH HEATER (Quarts)	WEIGHT (Pounds)	OVER-ALL LENGTH (Feet & Inches)
BUICK	SPECIAL (Series 40)	OHV V-8	188 @ 4,800	256 @ 2,400	3.63 x 3.2	264	7.5[b]	Regular	18 } d	3,742	17' 3"
	CENTURY (Series 60)	OHV V-8	236 @ 4,600	330 @ 3,000	4 x 3.2	322	8.4[c]	Premium	18 } d	3,807	17' 3"
	SUPER (Series 50)	OHV V-8	236 @ 4,600	330 @ 3,000	4 x 3.2	322	8.4[c]	Premium	18 } d	4,141	18'
	ROADMASTER (Series 70)	OHV V-8	236 @ 4,600	330 @ 3,000	4 x 3.2	322	9	Premium	20	4,278	18'
CADILLAC	SERIES 62	OHV V-8	250 @ 4,600	345 @ 2,800	3.81 x 3.63	331	9	Premium	20.34	4,370	18'
	ELDORADO	OHV V-8	270 @ 4,800	345 @ 3,200	3.81 x 3.63	331	9	Premium	20.34	4,809	18' 7"
	SERIES 75	OHV V-8	250 @ 4,600	345 @ 2,800	3.81 x 3.63	331	9	Premium	22.84	5,015	19' 9"
CHEVROLET	150, 210, BEL AIR — Manual-Trans. 6 [e]	OHV 6	123 @ 3,800	207 @ 2,000	3.56 x 3.94	235.5	7.5	Regular	17	3,125	16' 4"
	150, 210, BEL AIR — Automatic-Trans. 6 [e]	OHV 6	136 @ 4,200	209 @ 2,200	3.56 x 3.94	235.5	7.5	Regular	17	3,220	16' 4"
	150, 210, BEL AIR — Standard V-8 [e]	OHV V-8	162 @ 4,400	257 @ 2,200	3.75 x 3	265	8	Regular	17	3,095	16' 4"
	150, 210, BEL AIR — Special V-8[f] [e]	OHV V-8	180 @ 4,600	260 @ 2,800	3.75 x 3	265	8	Regular	17	3,127	16' 4"
CHRYSLER	WINDSOR DELUXE	OHV V-8	188 @ 4,400	275 @ 2,400	3.63 x 3.63	301	8	Regular	25	3,950	18' 3"
	NEW YORKER DELUXE	OHV V-8	250 @ 4,600	340 @ 2,800	3.81 x 3.63	331	8.5	Premium	26	4,160	18' 3"
DE SOTO	FIREDOME	OHV V-8	185 @ 4,400	245 @ 2,800	3.72 x 3.34	291	7.5	Regular	24	3,890[h]	18' 2"
	FIREFLITE	OHV V-8	200 @ 4,400	274 @ 2,800	3.72 x 3.34	291	7.5	Regular	24	3,960[h]	18' 2"
DODGE	CORONET 6	L-Head 6	123 @ 3,600	194 @ 1,600	3.25 x 4.63	230	7.4	Regular	14	3,295	17' 8"
	ROYAL	OHV V-8	175 @ 4,400	240 @ 2,400	3.63 x 3.26	270	7.6	Regular	20	3,425	17' 8"
	CUSTOM ROYAL	OHV V-8	183 @ 4,400	245 @ 2,400	3.63 x 3.26	270	7.6	Regular	20	3,485	17' 8"
	CUSTOM ROYAL SPECIAL	OHV V-8	193 @ 4,400	245 @ 2,800	3.63 x 3.26	270	7.6	Regular	20	3,540	17' 8"
FORD	MAINLINE, CUSTOMLINE, FAIRLANE [i]	OHV 6	120 @ 4,000	195 @ 1,800	3.62 x 3.6	223	7.5	Regular	16	3,106	16' 7"
	MAINLINE, CUSTOMLINE, FAIRLANE [i]	OHV V-8	162 @ 4,400	258 @ 2,200	3.62 x 3.3	272	7.6	Regular	20	3,216	16' 7"
	MAINLINE, CUSTOMLINE, FAIRLANE [i]	OHV V-8 Special	182 @ 4,400	268 @ 2,600	3.62 x 3.3	272	8.5	Premium	20	3,370	16' 7"
HUDSON	RAMBLER	L-Head 6	90 @ 3,800	150 @ 1,600	3.13 x 4.25	195.6	7.3[j]	Regular	12	2,630	15' 6"
IMPERIAL	CUSTOM IMPERIAL	OHV V-8	250 @ 4,600	340 @ 2,800	3.81 x 3.63	331	8.5	Premium	26	4,565	18' 7"
	CROWN IMPERIAL	OHV V-8	250 @ 4,600	340 @ 2,800	3.81 x 3.63	331	8.5	Premium	26	N.A.	20' 3"
LINCOLN	LINCOLN, LINCOLN CAPRI	OHV V-8	225 @ 4,400	332 @ 2,500	3.94 x 3.50	341	8.5	Premium	23	4,330	18'
MERCURY	MERCURY	OHV V-8	188 @ 4,400[m]	274 @ 2,500	3.75 x 3.30	292	7.6	Regular	20	N.A.	17' 2"
	MONTEREY	OHV V-8	198 @ 4,400[m]	286 @ 2,500	3.75 x 3.30	292	8.5	Premium	20	N.A.	17' 2"
	MONTCLAIR										
NASH	RAMBLER	L-Head 6	90 @ 3,800	150 @ 1,600	3.13 x 4.25	195.6	7.3[j]	Regular	12	2,630	15' 6"
OLDSMOBILE	88	OHV V-8	185 @ 4,000	320 @ 2,000	3.87 x 3.44	324.3	8.5	Premium	21.5	3,711	16' 11"
	SUPER 88	OHV V-8	202 @ 4,000	332 @ 2,400	3.87 x 3.44	324.3	8.5	Premium	21.5	3,762	16' 11"
	98	OHV V-8	202 @ 4,000	332 @ 2,400	3.87 x 3.44	324.3	8.5	Premium	21.5	3,864	17' 8"
PLYMOUTH	PLAZA, SAVOY, BELVEDERE [p]	L-Head 6	117 @ 3,600	194 @ 1,600	3.25 x 4.63	230	7.4	Regular	14	3,129	17'
	PLAZA, SAVOY, BELVEDERE [p]	OHV V-8	157 @ 4,400	217 @ 2,400	3.44 x 3.25	241	7.6	Regular	20	3,246	17'
	PLAZA, SAVOY, BELVEDERE [p]	OHV V-8	167 @ 4,400	231 @ 2,400	3.56 x 3.25	260	7.6	Regular	20	3,246	17'
	PLAZA, SAVOY, BELVEDERE [p]	OHV V-8	177 @ 4,400	231 @ 2,400	3.56 x 3.25	260	7.6	Regular	20	3,261	17'
PONTIAC	CHIEFTAIN	OHV V-8	173 @ 4,400[m]	256 @ 2,400	3.75 x 3.25	287.2	7.4	Regular	24.5	3,511	16' 11"
	STAR CHIEF	OHV V-8	180 @ 4,600[m]	264 @ 2,400	3.75 x 3.25	287.2	8	Premium	24.5	3,556	17' 6"
STUDEBAKER	CHAMPION	L-Head 6	101 @ 4,000	152 @ 1,800	3 x 4.38	185.6	7.5	Regular	11.5	2,780	16' 10"
	COMMANDER	OHV V-8	140 @ 4,500	202 @ 2,800	3.56 x 2.81	224.3	7.5	Regular	18.75	3,120	16' 10"
	PRESIDENT	OHV V-8	175 @ 4,500	250 @ 3,000	3.56 x 3.25	259.2	7.5	Regular	18.75	3,230	17' 2"

[a] Prices are suggested factory retail prices, with Federal taxes, but without state or local taxes, or transportation or preparation charges. They are for four-door sedans, of the least expensive series having the engines specified; [b] 8.4:1 compression on Special with automatic transmission; [c] 9:1 compression on Century and Super with automatic transmission; [d] 20 quarts with automatic transmission; [e] Either six with its transmission, or any combination of V-8 and transmission, is available in any series; [f] Includes four-barrel carburetor and dual-exhaust system; [g] Does not include Federal taxes; [h] With automatic trans-

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BODY AND CHASSIS SPECIFICATIONS												PERFORMANCE FACTORS				
WHEELBASE (Inches)	OVER-ALL STEERING RATIOS (to 1)		EFFECTIVE BRAKE-LINING AREA (Square Inches)	TRANSMISSION TYPES AVAILABLE	REAR-AXLE RATIOS (to 1)			TIRE SIZE	TURNING-CIRCLE DIAMETER (Feet & Inches)	SEAT-CUSHION WIDTHS (Inches)		WEIGHT PER HORSEPOWER (Pounds)	HORSEPOWER PER CUBIC INCH	POUNDS PER SQUARE INCH OF BRAKE LINING	PRICE[a]	DETAILS IN POPULAR SCIENCE MONTHLY (Month and Page)
	Manual	Power			Manual	Automatic	Overdrive			Front	Rear					
122	26.7	24.1	184.6	Man.; Auto.	3.9	3.6	—	7.10 x 15	41′ 6″	62.5	62.4	19.90	.712	20.27	$2,291	
122	26.7	24.1	207.5	Man.; Auto.	3.9	3.4	—	7.60 x 15	41′ 6″	62.5	62.4	16.13	.733	18.35	$2,548	Dec. '54
127	—	24.1	207.5	Man.; Auto.	3.9	3.4	—	7.60 x 15	43′	64.9	65.7	17.55	.733	19.96	$2,876	p. 129
127	—	24.1	219	Automatic	—	3.4	—	8.00 x 15	43′	64.7	65.7	18.13	.733	19.53	$3,349	
129	—	21.3	221.96	Automatic	—	3.36	—	8.00 x 15	43′ 5″	64.3	65.2	17.48	.755	19.69	$3,658	Dec. '54
129	—	21.3	221.96	Automatic	—	3.36	—	8.20 x 15	43′ 5″	64.1	52.6	16.81	.816	21.67	$5,814	p. 135
149.8	—	21.3	233.64	Automatic	—	3.77	—	8.20 x 15	51′ 8″	64.4	59.1	20.06	.755	21.46	$5,695	
115	25.7	23.3	158	Man.; OD	3.7	—	4.11	6.70 x 15	38′	62	63	25.41	.522	19.78	$1,728	Nov. '54 p. 135
115	25.7	23.3	158	Automatic	—	3.55	—	6.70 x 15	38′	62	63	23.68	.577	20.38	$1,906	
115	25.7	23.3	158	Man.; OD; Auto.	3.7	3.55	4.11	6.70 x 15	38′	62	63	19.10	.611	19.59	$1,827	Dec. '54
115	25.7	23.3	158	Man.; OD; Auto.	3.7	3.55	4.11	6.70 x 15	38′	62	63	17.37	.679	19.79	$1,886	p. 117
126	N.A.	N.A.	201	Man.; Auto.	3.73	3.54	—	7.60 x 15	43′ 9″	63.3	64	21.01	.625	19.65	$2,412[g]	Dec. '54
126	N.A.	N.A.	201	Automatic	—	3.36	—	8.00 x 15	43′ 9″	63.3	64	16.64	.755	20.70	$3,185[g]	p. 135
126	N.A.	N.A.	201	Man.; OD; Auto.	3.9	3.73	4.3	7.60 x 15	43′ 9″	63.3	64	21.03	.636	19.35	$2,268[g]	Dec. '54
126	N.A.	N.A.	201	Man.; OD; Auto.	3.73	3.54	4.1	7.60 x 15	43′ 9″	63.3	64	19.80	.687	19.70	$2,481[g]	p. 132
120	N.A.	N.A.	158	Man.; OD; Auto.	3.9	3.73	4.3	6.70 x 15	41′ 5″	62.5	62.8	26.79	.535	20.85	$1,912[g]	
120	N.A.	N.A.	173.5	Man.; OD; Auto.	3.73	3.54	4.1	7.10 x 15	39′ 7″	62.5	62.8	19.57	.648	19.74	$2,114[g]	Dec. '54
120	N.A.	N.A.	173.5	Man.; OD; Auto.	3.73	3.54	4.1	7.10 x 15	39′ 7″	62.5	62.8	19.04	.678	20.09	$2,265[g]	p. 132
120	N.A.	N.A.	173.5	Man.; OD; Auto.	3.73	3.54	4.1	7.10 x 15	39′ 7″	62.5	62.8	18.34	.715	20.40	N.A.	
115.5	25.3	25.3	192	Man.; OD; Auto.	3.89	3.3	4.11	6.70 x 15	41′	60.5	60.3	25.88	.538	16.18	$1,753	Dec. '54
115.5	25.3	25.3	192	Man.; OD; Auto.	3.78	3.3	3.89	6.70 x 15	41′	60.5	60.3	19.85	.596	16.75	$1,945	p. 117
115.5	25.3	25.3	192	Automatic	—	3.3	—	6.70 x 15	41′	60.5	60.3	18.52	.669	17.55	$2,275	
108	21.7	—	104.3	Man.; OD; Auto.	3.77	3.3	4.4	6.40 x 15	38′	60	59.5	29.22	.460	25.22	N.A.	Dec. '54 p. 123
130	N.A.	N.A.	201[k]	Automatic	—	3.54	—	8.20 x 15	45′ 2″	62.5	62	18.26	.755	22.71	$4,105[g]	Dec. '54
149.5	N.A.	N.A.	210[l]	Automatic	—	3.54	—	8.90 x 15	51′ 11″	62.5	62	N.A.	.755	N.A.	N.A.	p. 140
123	26.1	21.3	220.1	Automatic	—	3.07	—	8.00 x 15	45′ 7″	62.3	62.1	19.24	.660	19.67	N.A.	Dec. '54 p. 135
119[n]	25.4	25.4	190.9	Man.; OD; Auto.	3.73	3.15	4.09	7.10 x 15	42′ 4″	60.6	60.3	N.A.	.644	N.A.	N.A.	Dec. '54
119[n]	25.4	25.4	190.9	Automatic	—	3.15	—	7.10 x 15	42′ 4″	60.6	52.5[o]	N.A.	.678	N.A.	N.A.	p. 126
108	21.7	—	104.3	Man.; OD; Auto.	3.77	3.3	4.4	6.40 x 15	38′	60	59.5	29.22	.460	25.22	N.A.	Dec. '54 p. 123
122	27.5	25.7	191.7	Man.; Auto.	3.42	3.07	—	7.10 x 15	42′	62.3	62.4	20.06	.570	19.36	$2,151[g]	
122	27.5	25.7	191.7	Man.; Auto.	3.42	3.23	—	7.60 x 15	42′	62.3	62.1	18.62	.623	19.62	$2,278[g]	Dec. '54
126	27.5	25.7	191.7	Man.; Auto.	3.42	3.42	—	7.60 x 15	43′	62.3	62.1	19.13	.623	20.16	$2,579[g]	p. 124
115	N.A.	N.A.	158	Man.; OD; Auto.	3.73	3.73	4.1	6.70 x 15	40′ 1″	62.5	62.8	26.74	.509	19.80	$1,622[g]	
115	N.A.	N.A.	166.2	Man.; OD; Auto.	3.73	3.54	4.1	6.70 x 15	40′ 6″	62.5	62.8	20.68	.651	19.53	$1,718[g]	Dec. '54
115	N.A.	N.A.	166.2	Man.; OD; Auto.	3.73	3.54	4.1	6.70 x 15	40′ 6″	62.5	62.8	19.44	.642	19.53	$1,718[g]	p. 117
115	N.A.	N.A.	166.2	Man.; OD; Auto.	3.73	3.54	4.1	6.70 x 15	40′ 6″	62.5	62.8	18.42	.681	19.62	$1,748[g]	
122	25	24	178	Man.; Auto.	3.64	3.08	—	7.10 x 15	42′ 5″	61.8	63.1	20.29	.602	19.72	$2,163	Nov. '54
124	25	24	178	Man.; Auto.	3.64	3.23	—	7.10 x 15	42′ 11′	61.8	63.1	19.75	.627	19.98	$2,362	p. 130
116.5	19.5	20	166	Man.; OD; Auto.	4.1	3.54	4.56	6.40 x 15	39′	59.5	59	27.52	.544	16.75	$1,759	
116.5	24	20	195.3	Man.; OD; Auto.	4.1	3.54	4.27	6.70 x 15	39′	59.5	59	22.29	.624	15.97	$1,888	Nov. '54
120.5	24	20	195.3	Man.; OD; Auto.	3.92	3.54	4.27	7.10 x 15	40′ 6″	59.5	59	18.46	.675	16.54	$2,280	p. 150

mission; [i] Either the six or standard V-8, with any transmission, is available in any series. Special V-8 is available only with automatic transmission, and only on station wagons or Fairlane models, [j] 7.5:1 compression optional; [k] Drum brakes; [l] Disk brakes; [m] Either engine available with any model, [n] Station wagons have 118-in. wheelbase, and are 4½ in. shorter over-all; [o] On Montclair only; [p] Any engine and any transmission available on any model. Figures given here are for the Plaza with four engine choices. NOTE: Designation N.A. means information not available at press time.

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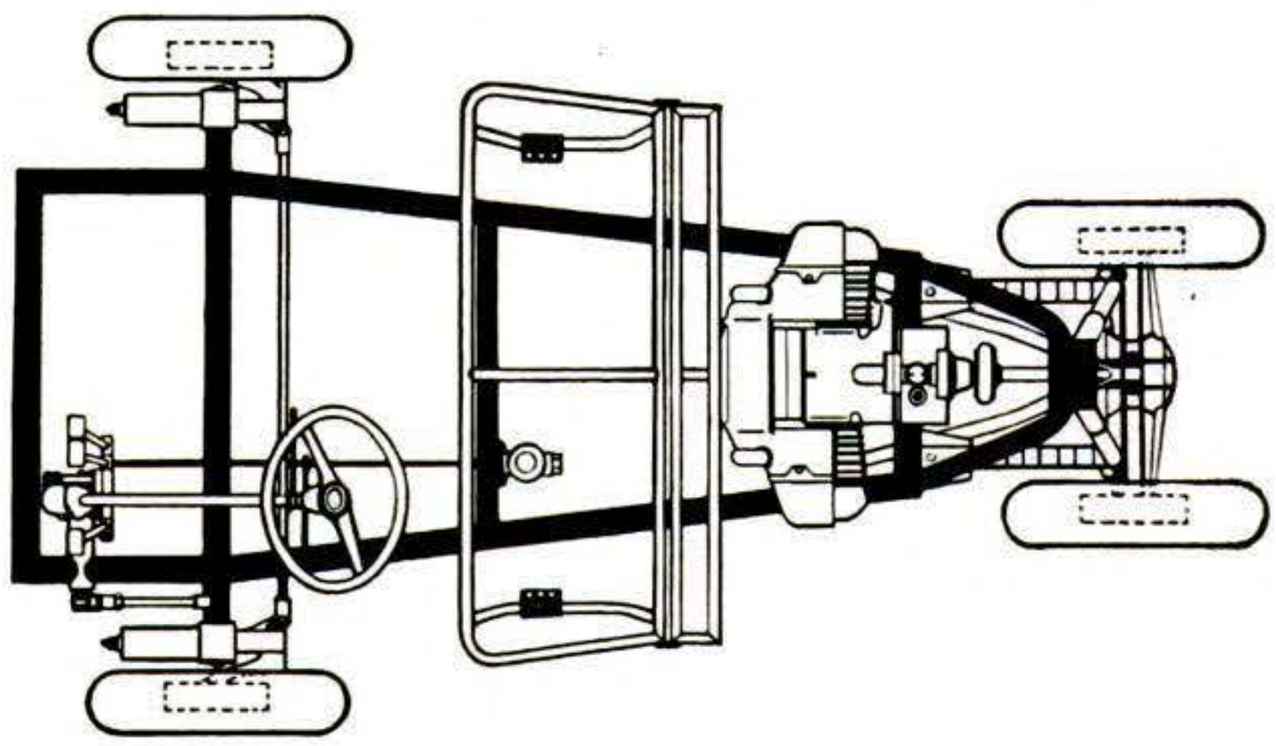
Novel Twists Distinguish Foreign Cars

French Ford Is Fancy Job. Completely restyled to give it the chic of its American cousins, this French-made Ford, the Vedette (translation: Star Performer), made its debut in Paris recently. Its 80-horsepower V-8 engine has only half the power of its U.S. counterpart, but since the car's weight also is only half as much, top speed of both is about the same.

Air-Cooled Engine Boils Water. If you want to brew tea or heat shaving water while on the road, the gadget shown at left will do the job in a jiffy. It is a three-quart aluminum tank that fits on the muffler of the German Volkswagen's rear-mounted engine. A valve lets off steam when the water comes to a boil.



Motorbike Engine Gets Four Wheels. Seventy-five miles to the gallon is claimed for this tiny German Hoffmann Auto-Cabin. The engine that speeds the two-seater at 50 miles an hour is a two-cylinder, 15-horsepower, flat-twin package (shown on stand next to the car) that has already proved itself in many European motorcycle races. The air-cooled, four-speed engine is located just forward of the rear end, as seen in the skeleton drawing. Big-car features of the 770-pound midget include a dashboard instrument panel and a gearshift lever under the steering wheel.

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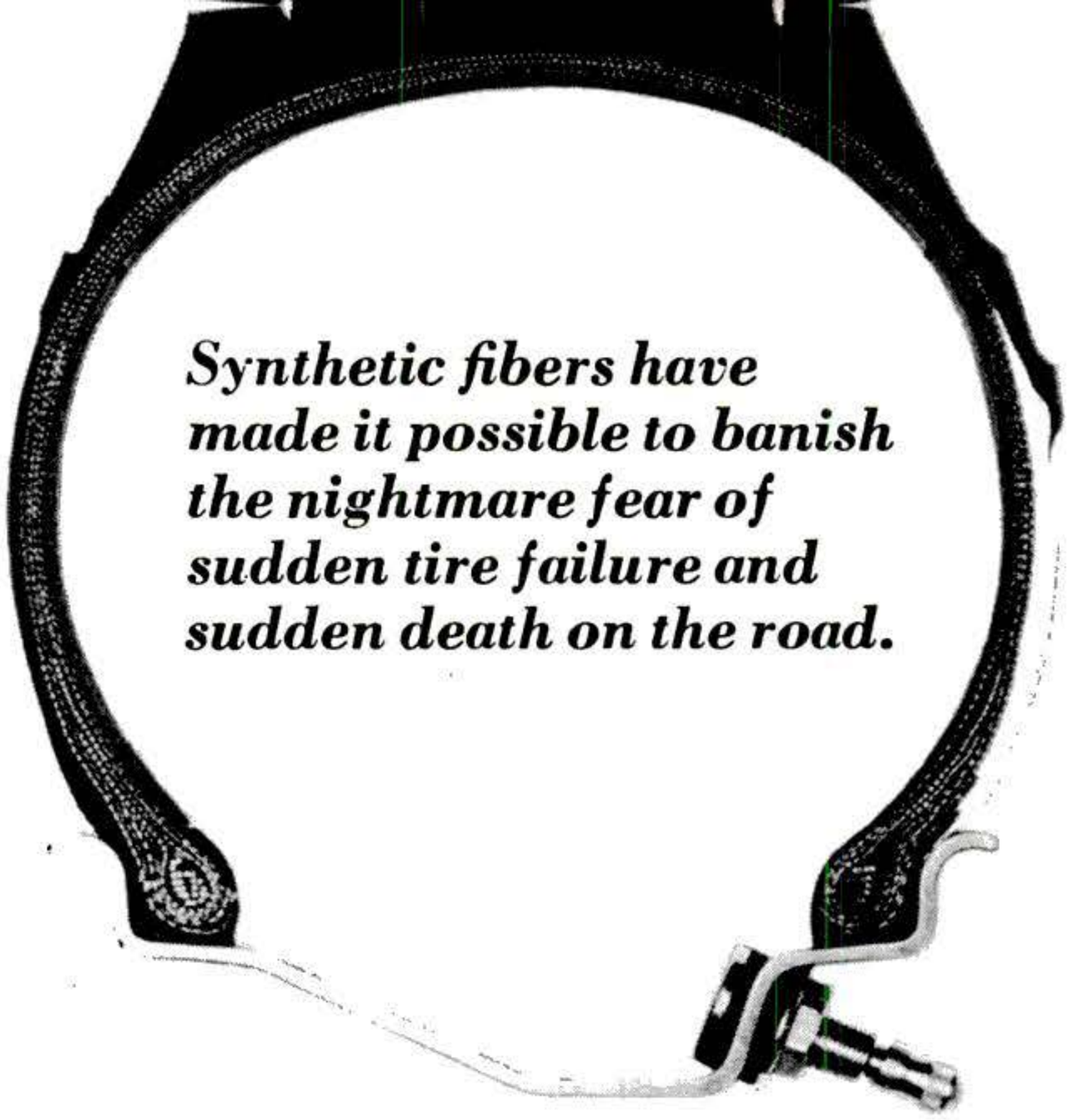

What every driver should know about Tubeless Tires

By Devon Francis

WHILE going 95 m.p.h. on a country road a few years ago, Frank Herzegh lost control of his car. Before he came to a shuddering stop, he had barrel-rolled ten times!

When Herzegh crawled out of the wreckage, he looked first at his tires. "Hm," he remarked to himself, "it was a tube."

Herzegh had designed a tire without a tube for Army trucks in 1941. An ardent home-workshopper, he never permits any mechanic but himself to touch his personal car. Employed by Goodrich as a tire engineer, he even did most of his preliminary work on his firm's tubeless passenger-car tires at home.

When his car crashed, it was shoed with two tubeless tires and two conventional tires with tubes. That accident convinced him that he and others who were working on tubeless tires were on the right track.

Tire troubles figured in about a third of the fatal auto accidents in 1953 in which "some unsafe condition" of the vehicles was reported. The tubeless tires that Detroit now puts on all new cars, unless the buyer specifies that he wants tubes, may increase highway safety. They go down more slowly when punctured and are less liable to blow out.

The fibers are synthetic: Wreck the fibers in a tire and you wreck the tire. These fibers go into the "plies" that tire men talk about. (A four-ply tire has four layers of rubber-impregnated fabric.) Cotton was used for more than 50 years, but it wouldn't do for tubeless tires, which must be leakproof.

Cotton fibers are short and hollow. They lack the strength needed to seal off compressed air for tens of thousands of miles of flexing on the road, and the natural oils in them resist absorption of the plastic conditioners needed to make a tire carcass airtight.

Rayon and Nylon Have What It Takes

Two synthetic fibers, rayon and nylon, made tubeless tires practical. One or the other of these fibers is woven into the fabric of all tubeless tires. No company has a monopoly on fabrics.

Both rayon—used in tire-making since 1935—and nylon are continuous filaments. They are solid, and strong. Try breaking cotton, rayon and nylon threads of equal diameter. The cotton will part. The rayon will sear your hands. And you'll probably give up on the nylon. Both of these synthetics are dry and absorb the resin conditioners used by tire manufacturers.

These synthetics made it possible to

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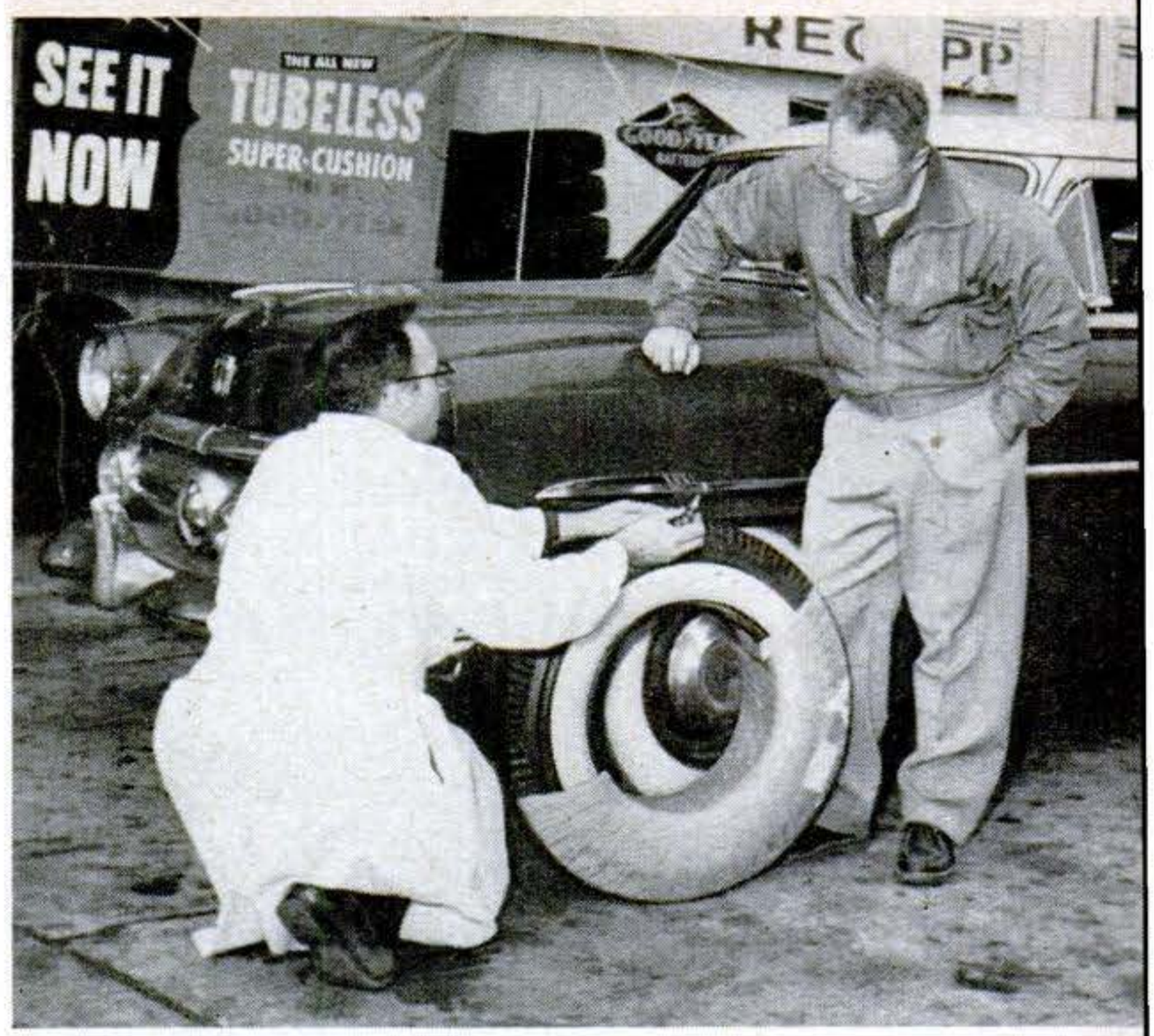
How to Put Tubeless Tires on Your Old Rims

introduce tubeless tires for passenger cars, at a premium price, seven years ago. Now reductions in the cost of rayon and a simplification of processing have made possible the production of tubeless tires as non-premium, original equipment on the new cars. Nylon tires still cost more because nylon fabric is more expensive.

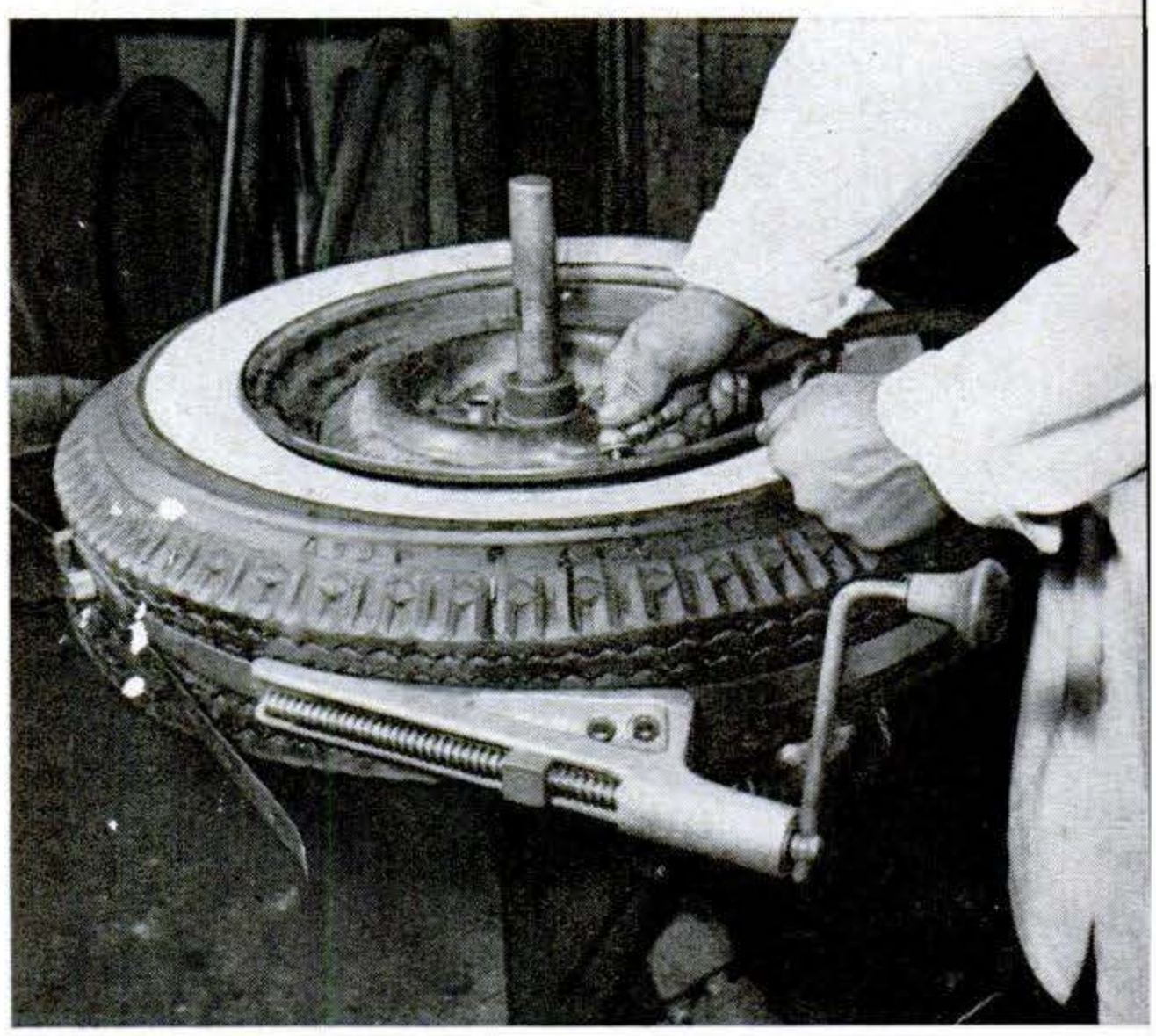
Similar but different: The tire industry's Big Four—Goodrich, Goodyear, Firestone and U.S. Rubber—supply the bulk of the original tires put on new cars. All four are making tubeless tires that contain synthetic cords.

All but Goodyear have thin artificial rubber "liners" adhered to the inside of their tires. These liners are known as a "butyl blend" and consist principally of natural rubber and reclaimed butyl. Goodyear does not consider such a liner necessary in its tire.

Although superficially similar, there are differences between various makes and types of tubeless tires. Goodrich puts a soft butyl sealant on the liner of its premium tires as added insurance against loss of air in case of a puncture. Goodyear sells an accessory tubeless tire "shield," a sort of tubeless-tire-within-a-tire, as added protection against blowouts. Firestone has a premium nylon puncture-sealing butyl adhered liner and a two-ply nylon-laced diaphragm, or shield. Other companies have other variations.



1 HOW LONG does it take to put tubeless tires on old rims? "About 20 minutes," said the man at Mohawk Service in Stamford, Conn.



4 ONLY SPECIAL TOOL used is a "constrictor," which works like a tourniquet to snug the tire beads tightly against the rims.

No More Nightmares

What you gain: The tubeless tire should earn its keep on your car if for only one reason—it virtually does away with most of the nightmare of that sudden, thumping, crunching flat and the frightening loss of control at high speeds. It serves you just as well if you collect a nail at 20 miles an hour on your way to the grocery.

Here's why: When a tubed tire is badly punctured, the air escapes into the casing almost instantly, then comes out through the valve hole in the rim. That can't happen with a tubeless. The valve is sealed in the rim.

Tubeless tires also give considerably more mileage. That's largely because they run cooler. They're lighter, there's no tube to create friction heat against

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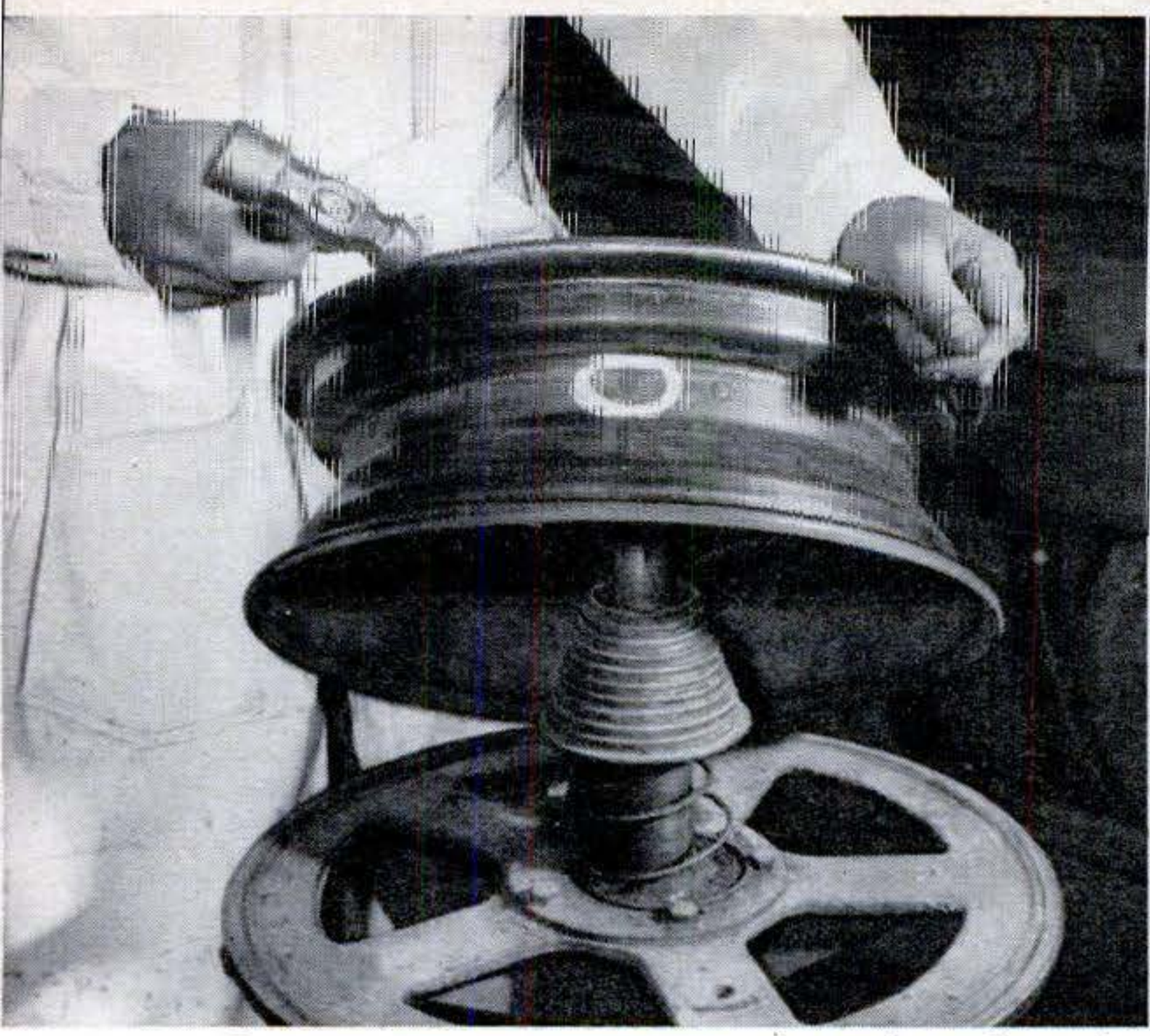

2 RIMS ARE SMOOTHED DOWN with steel wool. Then loose rivets are tightened with a ball-peen hammer to make the rims airtight.

3 VALVES GO THROUGH RIM like this. A flange-type rubber washer, a flat rubber washer and a metal washer keep air from escaping.

5 SOAPY WATER is used to check for leaks. Bubbles show that this valve is loose. Tightening it made the tubeless tire airtight.

6 TIRES SHOWN HERE cost $33.79 each. Allowance on old casings toward this set was $4 apiece. Shoeing the car took 19 minutes.

the casing, and the metal rim readily radiates heat.

Tubeless tires provide fewer puncture emergencies. Taxi fleets report an average of one-third as many flats for each 100,000 miles of operation.

At least one automobile manufacturer has inquired seriously of Akron whether that fifth rim and tire can't be discarded as part of a car's original equipment.

Replacing tubed tires with tubeless poses no problem. They can be bought one at a time. They are interchangeable with the tubed product. Don't worry about shimmy on account of the difference in weight—there is a greater disparity between the weight of a new tubed

[Continued on page 266]

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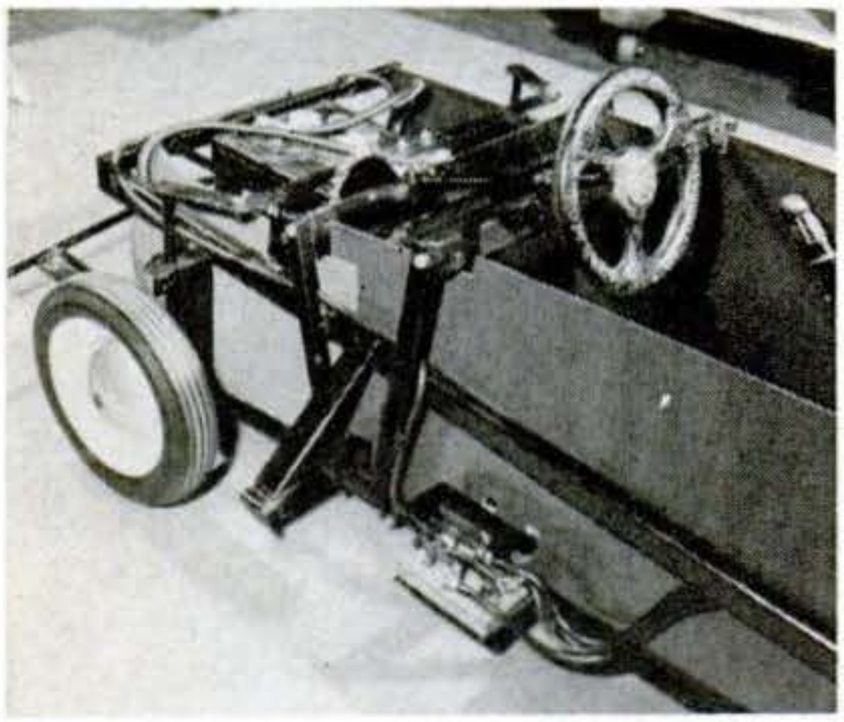
Two can ride, if they are well acquainted. The accelerator is a normally-off foot switch.

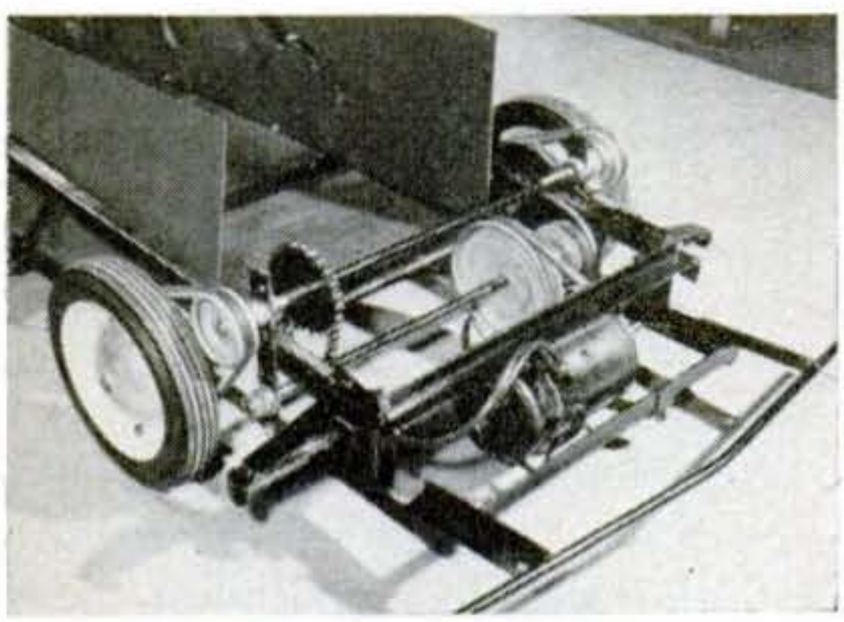
Child's Car Hits 5 M.P.H.



KNIFE SWITCH at side, protected in use, reverses car. Chain and sprockets reduce steering ratio for kids.

SMALL fry with indulgent elders can now swank around in miniature versions of Ford's sporty Thunderbird. Sized for youngsters from 3½ years up, the little electric car is driven by a starter motor and a 120-ampere-hour battery, which drives it for about five miles at a five-m.p.h. top speed. Overnight trickle-charging brings the battery back to full strength.

Colored turquoise like some of its big brothers, the plastic body won't rust if Junior leaves it out in the rain. Working headlights, tail lights, and horn give him controls to operate, and there is an electrical reversing switch. It helps if Junie has a rich uncle; the car, made by PowerCar Company, Mystic, Conn., lists for $395.



THREE-STAGE reduction drive gives ample power without high current draw. On stall, belt slip prevents burn-out.

A TRAFFIC STOPPER, little car is not ordinarily meant to venture on the highway. Its builder reports that little kids soon get knack of maneuvering car agilely.

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A BUSY MAN, Allard grabs a quick shave in his car seat.

Sports-Car Maker Tests New Ideas

Sydney Allard explains a British racing driver's philosophy and peers into the future while driving his own Palm Beach.

By John Pfeiffer

WE WERE speeding along a concrete highway in Surrey, just outside London. Our car was a lively, bronze-colored Allard Palm Beach model. It had a standard Ford Zephyr engine. But there was nothing standard about the chassis—a specially built job that permitted us to do things you wouldn't dream of trying in a conventional car.

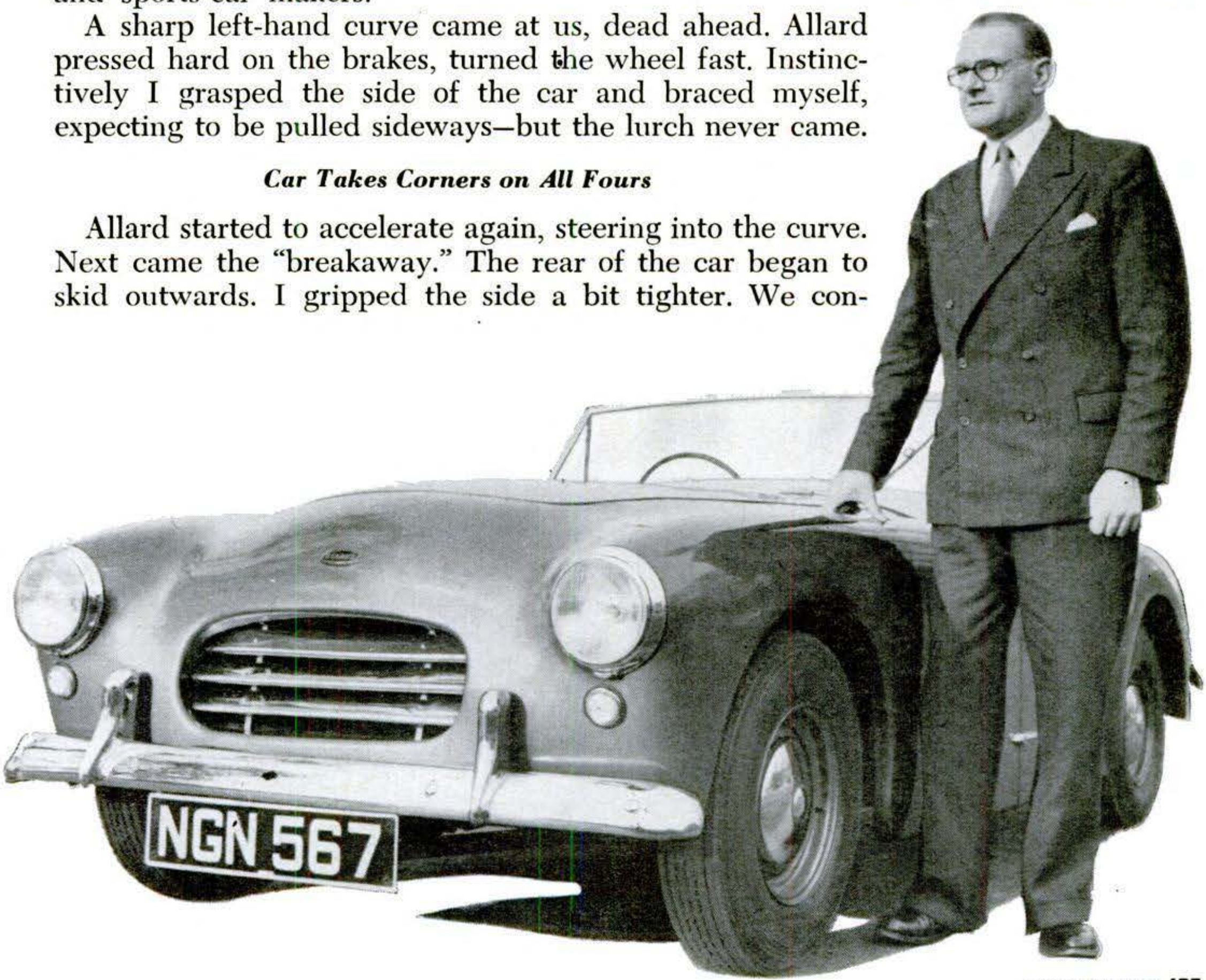
The driver was the man who designed it, Sydney Herbert Allard. He is one of Britain's most publicized racing drivers and sports-car makers.

A sharp left-hand curve came at us, dead ahead. Allard pressed hard on the brakes, turned the wheel fast. Instinctively I grasped the side of the car and braced myself, expecting to be pulled sideways—but the lurch never came.

Car Takes Corners on All Fours

Allard started to accelerate again, steering into the curve. Next came the "breakaway." The rear of the car began to skid outwards. I gripped the side a bit tighter. We con-

DESIGNER TOWERS ABOVE one of his Palm Beach models. With a Ford engine in the hand-built chassis, it costs about $2,500. A huskier Allard K-3, with a Chrysler engine, costs $4,300. Allard's factory turns out only three cars a week.



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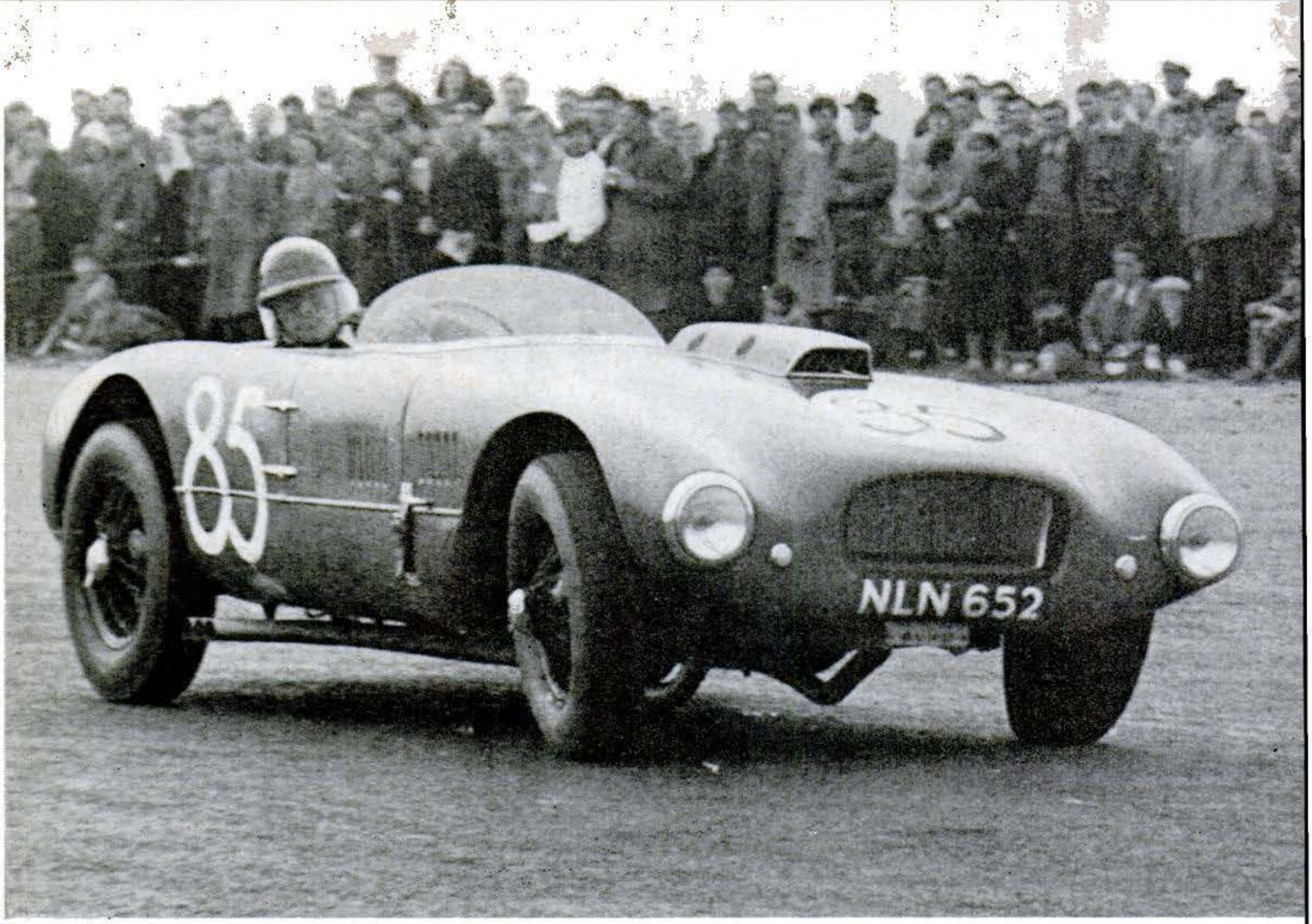

At the wheel of one of his cars, Allard cuts a corner at 80 m.p.h. Photo shows how outer

tinued accelerating all through the curve, hitting a peak of more than 75 miles an hour, and came out of it like a missile from a slingshot.

"You're not used to sports cars," Allard grinned, as we hit a straightaway. "A regular car has a chronic feel to it as you go fast around a bend. It rolls and feels out of control and you're thrown to the side. But go around the same corner at the same speed in a sports car and there's no lurching or heeling over. That's good cornering. It's like riding on rails."

Allard has a faint Cockney accent; "rails" came out "riles." He speaks almost as fast as he drives, in a soft voice that doesn't quite go with his six-foot-three, fullback build.

"A Sports Car Is Romantic"

"This is a sport like skiing or yachting," he continued. "As you get older you don't feel for it in quite the same way. A sports car is romantic. It's mainly for young people. You're in control all the way. Watch this!"

He accelerated suddenly around another curve—and the steering wheel hardly seemed to move. "In an American car or any other conventional model, it takes four to five full turns of the steering wheel to move the front wheels from the extreme right to the extreme left. Of course, low gearing makes for easy steering. But the car responds slowly.

More Effort—Faster Action

"In this car you have high-gear steering. The wheel can make only about two turns. That means you have to exert a bit more effort, but you get much faster action. You can steer safely at high speeds. For example, when I round a bend and the back wheels start to slide, I know about it in a split second. There's an added torque on the steering wheel. I can feel the road in my fingers.

"That's the exciting thing about sports driving. A sports car shouldn't be regarded as a means of transportation. You use it for fun, a weekend jaunt. You're sensitive to the feel of the road and the car, just as if you were riding horseback."

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front wheel heels in because of the split axle.

During our two-hour "horseback" ride we took more high-speed skids, several on the tricky dirt surfaces of English country lanes. There was also a fast drive up the sort of grades used in hill-climbing contests—Allard has won many hill-climbing awards, including the British championship.

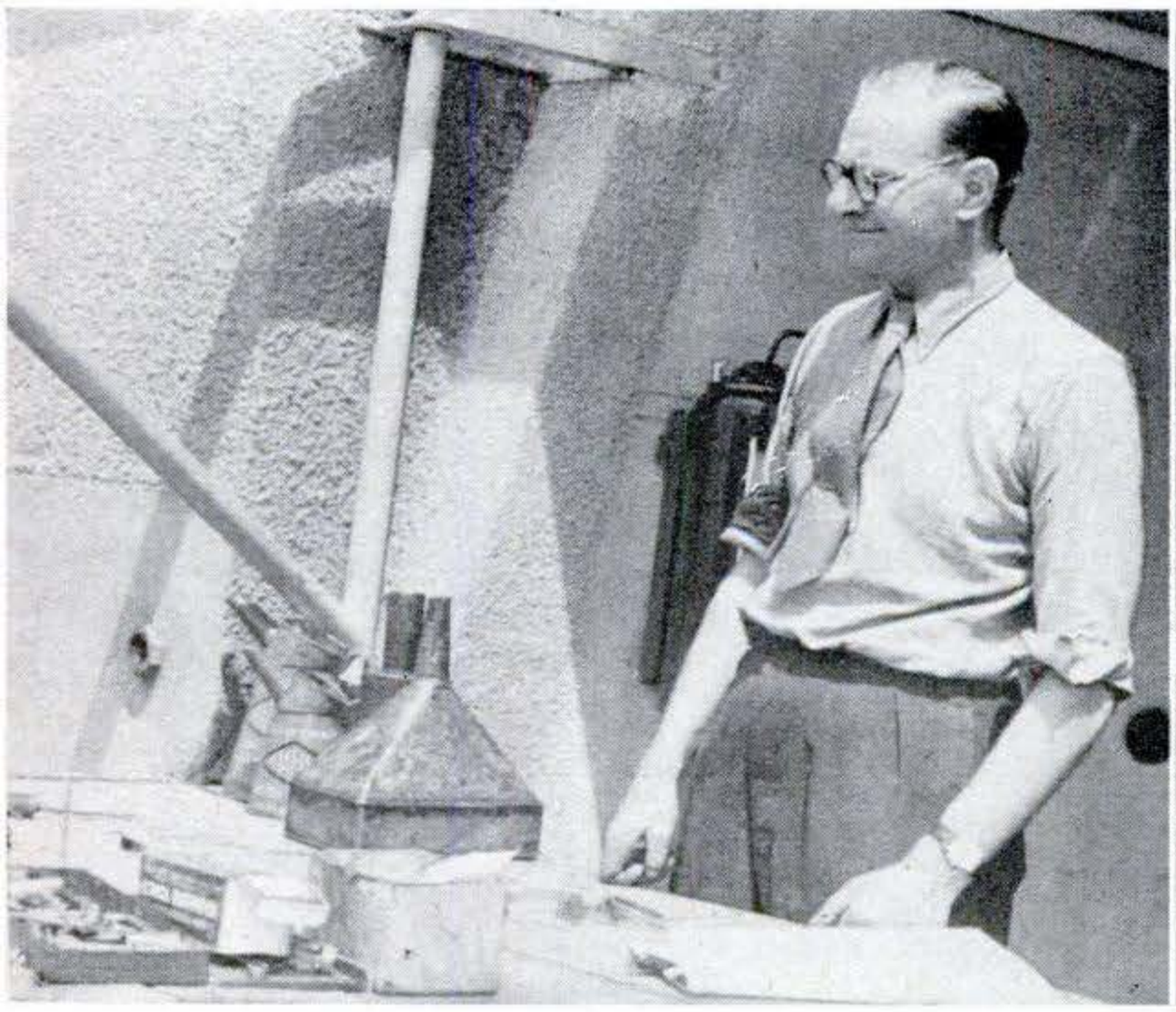
He has been experimenting with cars for more than 25 years. In 1929, when only 17, he bought a Super Sports Morgan, a three-wheeler (two in front, one in back), and began working on it after hours in his father's garage. He did such an expert tuning-up job that later in the year he won the first race he ever entered.

Tinkering Didn't Help

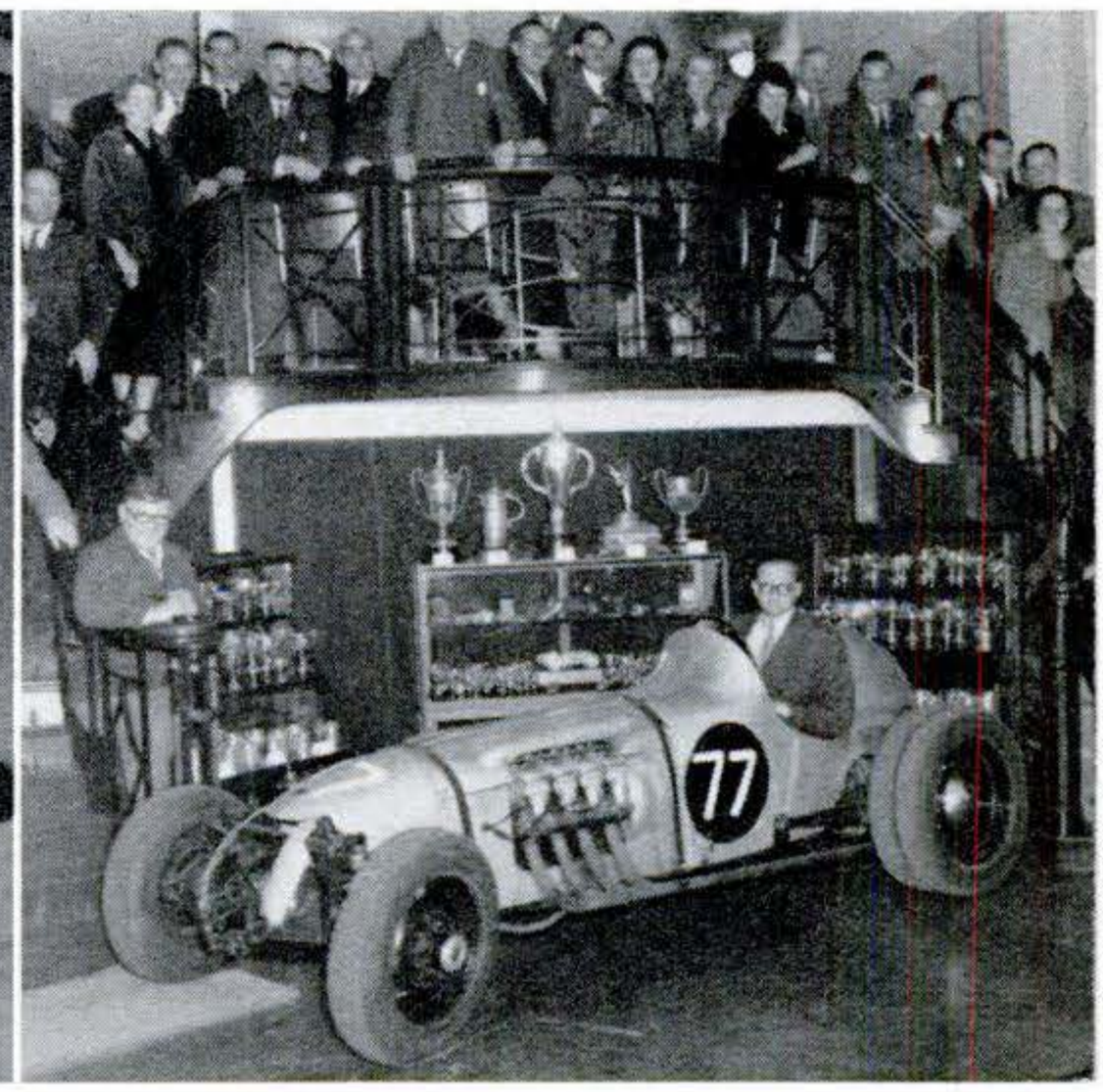
Soon he was tinkering with the car again. ("Sydney never left a winner alone," an associate recalled recently.) He converted the Morgan into a four-wheeler. But it was low on power, the parts didn't fit well, and it kept breaking down. Then there was a Talbot from the Midlands, which also failed in competition.

Allard's luck picked up in '36, when someone drove a Ford V-8 into a lamppost. He bought it from the insurance company for $25 cash. The young driver salvaged the engine, chassis side frame, gearbox, transmission, axles, speedometer and other instruments. He sawed the front axle in half and used it as his

[Continued on page 268]



IN THE PITS at Le Mans, Allard directs the strategy of his drivers against Europe's best in the famous French 24-hour race dedicated to improving the breed of sports cars.



STAFF AND TROPHIES loom behind Allard in this habitat portrait of him aboard one of his early racing cars. His triumphs include winning the 2,000-mile Monte Carlo Rally in 1952.

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New autos, even though of prewar design, draw covetous glances from East German crowds.

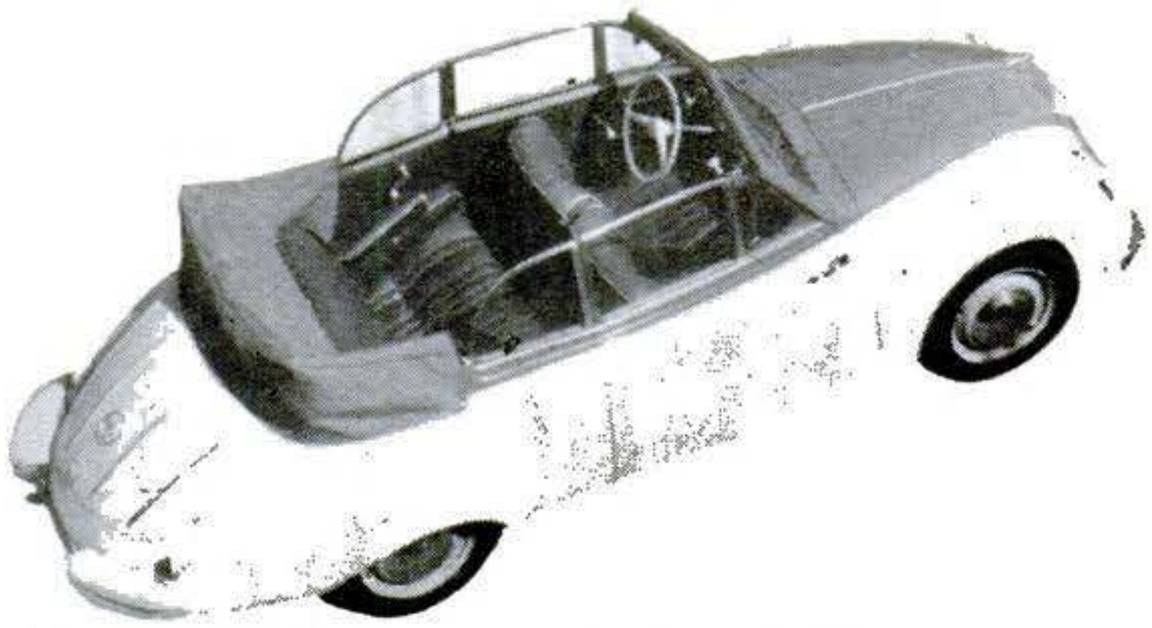
RUSSIAN

THE POBEDA, of original Soviet design, is ruggedly built for rough Russian roads. A four-cylinder, 50-hp. engine powers the 3,000-pound car. Top speed is put at 65 m.p.h.

THE MOSKVITCH, copied from the prewar German Opel Cadet, has a four-cylinder engine developing only 23 hp. It has synchromesh transmission. Top speed is 56 miles an hour.

EAST GERMAN

EMW FOUR-SEAT CONVERTIBLE has a six-cylinder, in-line engine of 57 hp. Copied from the West German BMW, it features such luxuries as leather upholstery, an engine oil heater.



THE IFA F9 has a two-stroke, three-cylinder engine developing 32 hp. Other models are a four-seater sedan and a station wagon. A lot of these are exported to western Europe.

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Industrial fair in Eastern Germany shows

Cars Behind the Iron Curtain

PASSENGER automobiles produced by Russia and her satellite countries that were shown recently at the Leipzig Fair, in East Germany, offered no threat to Detroit.

Production of cars in the Communist countries is as limited as is the variety. Only nine basic models are turned out by the four countries making cars.

Soviet cars are conventional. All have side-valve engines with low compression ratios, for high-octane gas is not readily available for private motoring.

Czech designs are more inspired, and go in for such features as all-wheel independent suspension, torsion-bar springing, rear-mounted air-cooled engines.

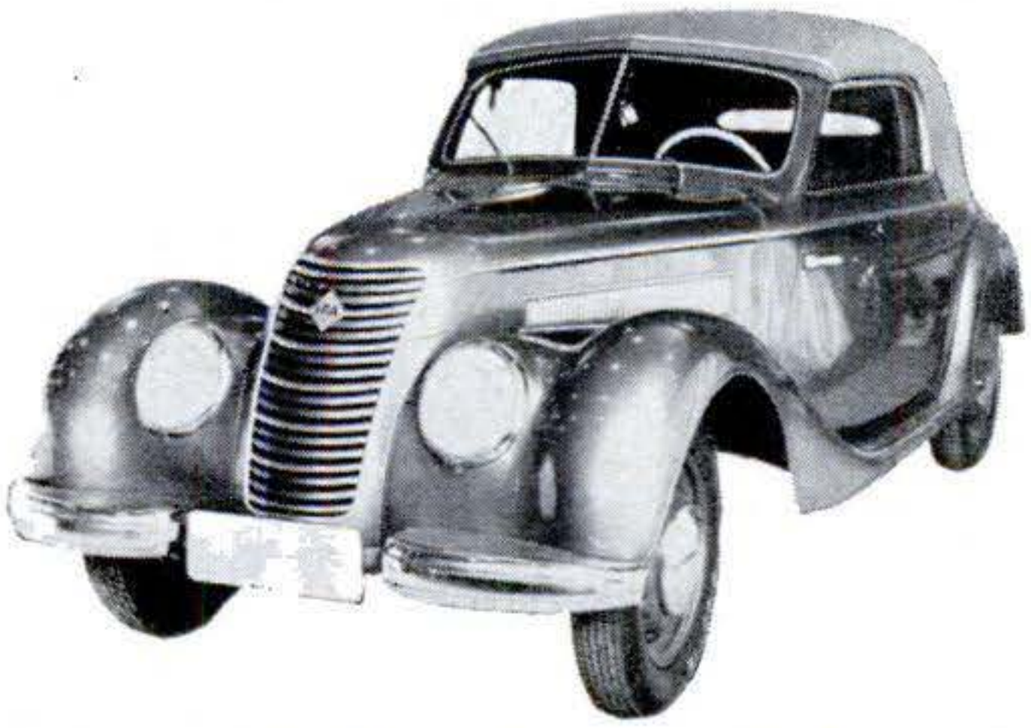
The East Germans seem to have concentrated on developing two-stroke engines with front-wheel drive.

Poland's first and only car, the Warsawa, is a copy of the Russian Pobeda.

Here are shown some of the Communist cars, which fall into two categories: light, and cheap to run; or rugged, heavy, and underpowered.—*David Scott.*

THE ZIM, Russia's tribute to early postwar Detroit, has a 90-hp. engine. It has fluid drive, a three-speed gearbox and steering-column control. Top speed is 80 m.p.h.

CZECH The Skoda 1200 is another poor power-to-weight-ratio job. A 36-hp. engine powers this 3,000-pound, 65-m.p.h. car. Wheels are independently sprung.



THE IFA F8, with a two-cylinder, 20-hp. engine, has a top speed of only 50 m.p.h., but it gives 46 miles to the gallon. Body is steel; front fenders are made of plastic.

POLISH The Warsawa was shown in fancy display but it is just another Pobeda. Russia supplied drawings, machines, jigs and dies for local manufacture.

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Robot Snow Remover Can Talk, Too!

THAT it can talk but not talk back is just one advantage of this robot snow remover over the human variety. While you sit cozily behind a picture window, it will buck wintry blasts to clear your drive or walks. All you do is crook your finger.

Should you need to relax after such hard work, it will trundle down to the corner store, ask for the evening paper or a pack of cigarettes by brand name, and bring them back to you.

A sensitive radio receiver mounted on the machine delivers your words through a loudspeaker. However, if you have a small boy trained to run errands, better not fire him. Reo Motors, Inc., which developed the machine as an offspring of remote-control power mowers, has no plans for putting it on the market just yet. It will be built only on special order, at a proportionately high price.

CHUGGING ABOUT its work, the robot is controlled by a small box with two switches on it. One turns it right, the other left. If neither is touched, it moves straight ahead. The radio transmitter (in bag on window sill) has a range of one mile. Practical use is limited by the distance machine can be seen.

CONTROL is so sensitive that an experienced operator can make the machine perform intricate maneuvers. Short-wave impulses control relays. These actuate solenoids that work hydraulic valves. Right-turn impulse, for example, makes hydraulic system cut power to right wheel. Left wheel then swings machine to right. Funnel-like gadget is the antenna.

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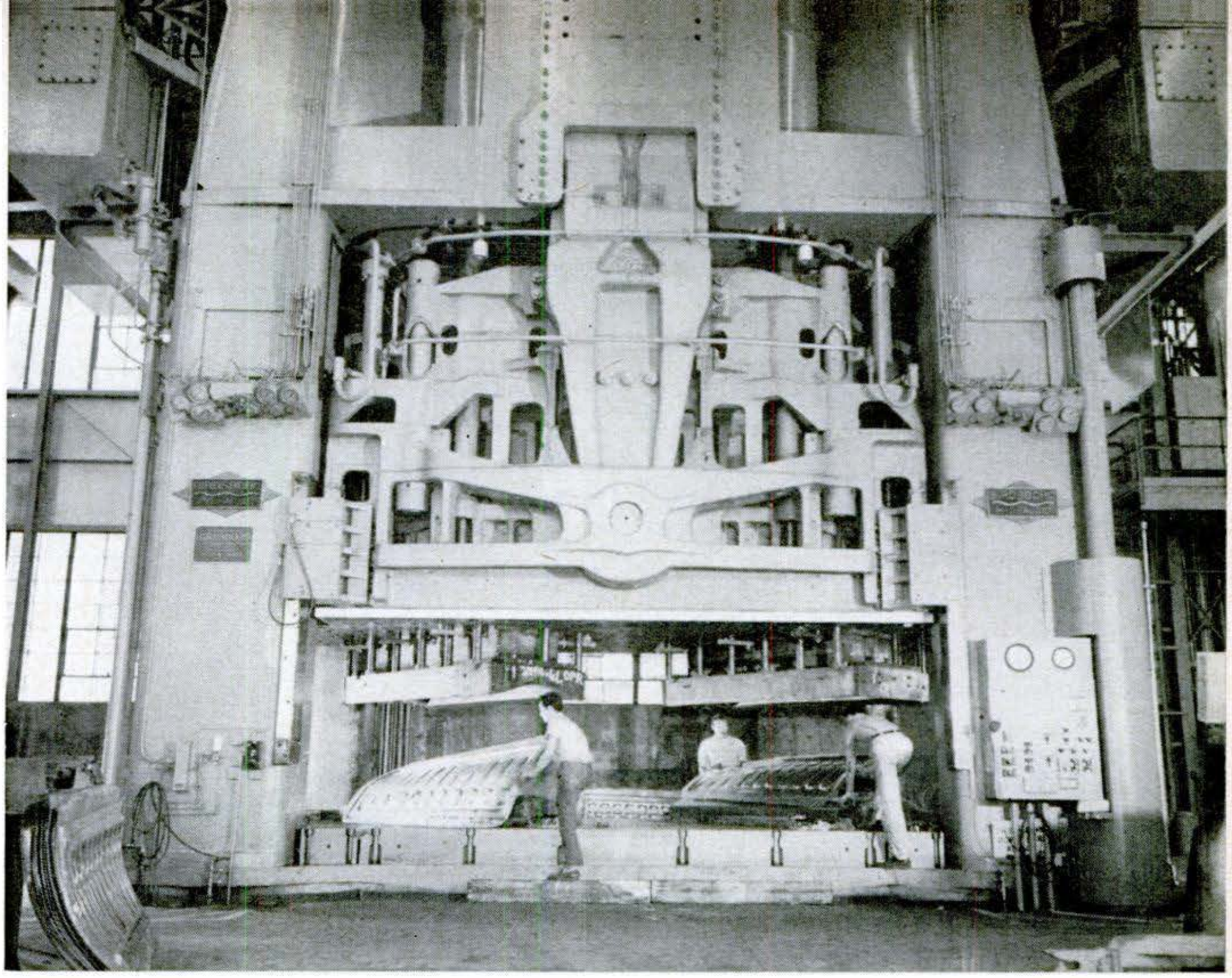

THOUSAND-TON PRESS squeezes aluminum with 8,000-ton pressure to form parts for today's planes. The 36-foot-high machine is anchored in a thick concrete foundation extending 12 feet below the floor. Three 200-horsepower motors furnish power. Cost: $1,000,000.

Mechanical Monsters Replace Rosie the Riveter

Giant machines pound, press, pull and shape today's aerial mammoths into flying form.

ROSIE the Riveter of World War II is only a memory in today's sprawling airplane factories. She has been replaced by mechanical monsters that build planes in a new way.

The weight of a 160-car freight train presses down inexorably on a sheet of the toughest aluminum alloy yet made. Cutting tools tear at giant slabs of metal. Steel-jawed stretchers change sheets and extrusions into new forms.

Instead of the tens of thousands of rivets Rosie drove to assemble many small parts, there are now fewer rivets holding together bigger, huskier pieces of the framework and skin. Though larger, today's airplanes are actually simpler, faster, lighter—and stronger.

Of the new method, Clarence L. Johnson, Lockheed Aircraft designer, says, "It's as new as sheet metal was over wood and fabric. We're reducing weight, increasing strength."

For a look at what's happening in today's aircraft factories, see the picture story on the next two pages.—*Andrew R. Boone.*

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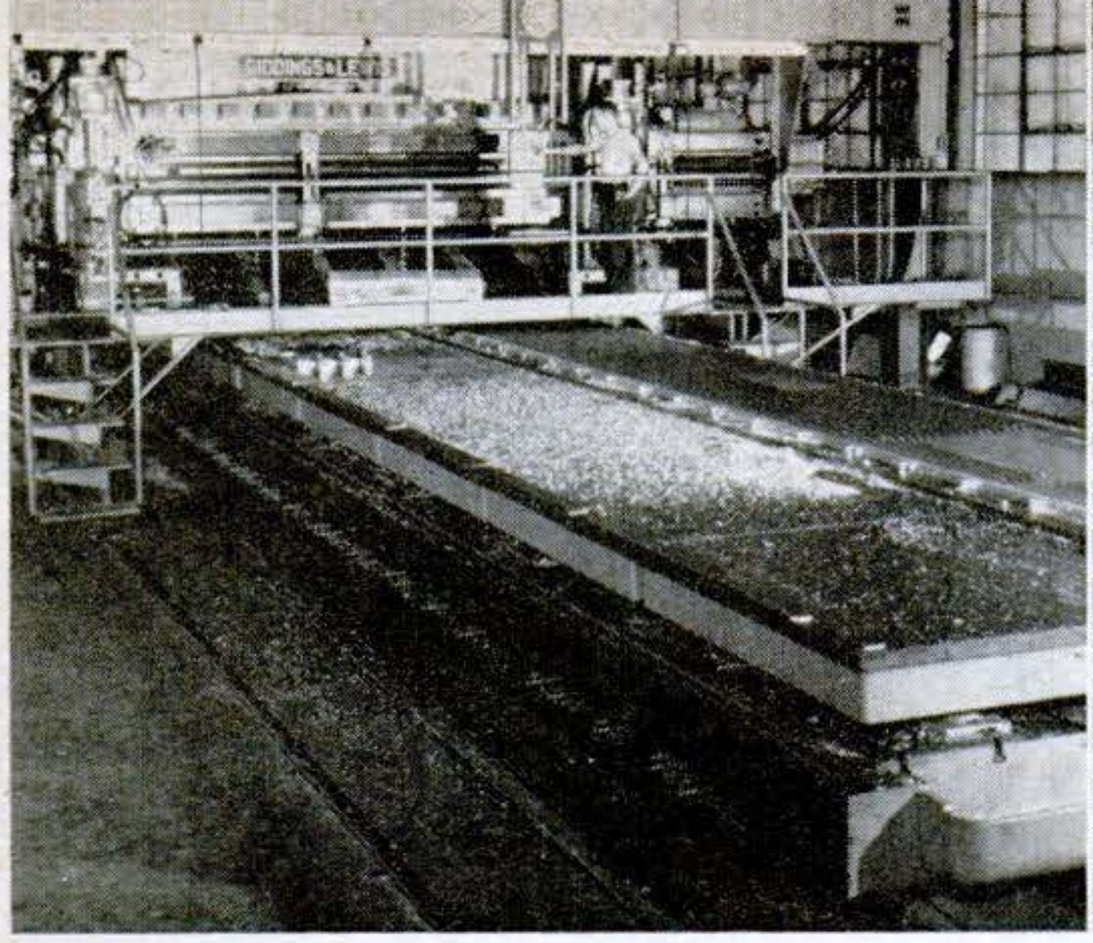
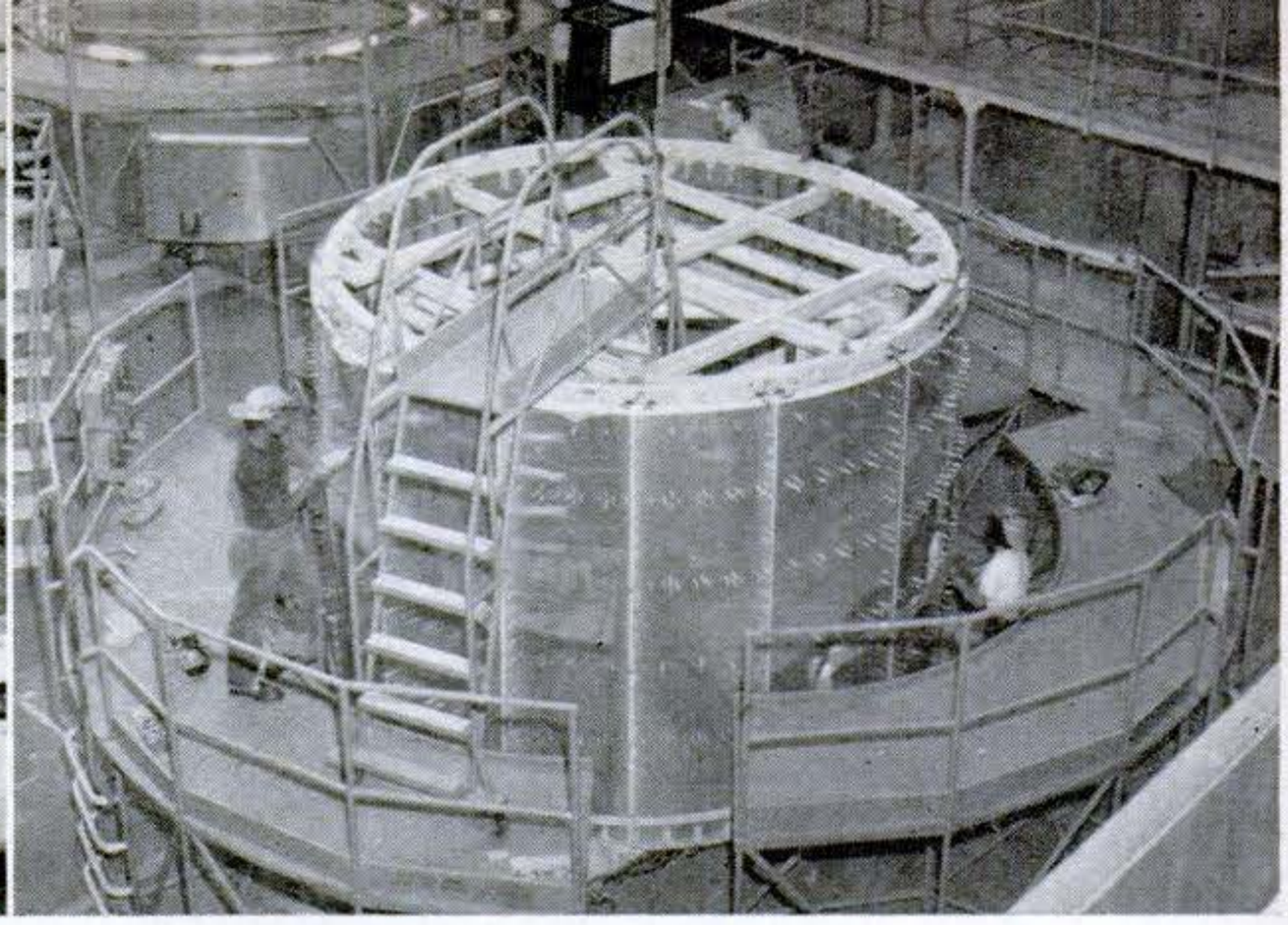
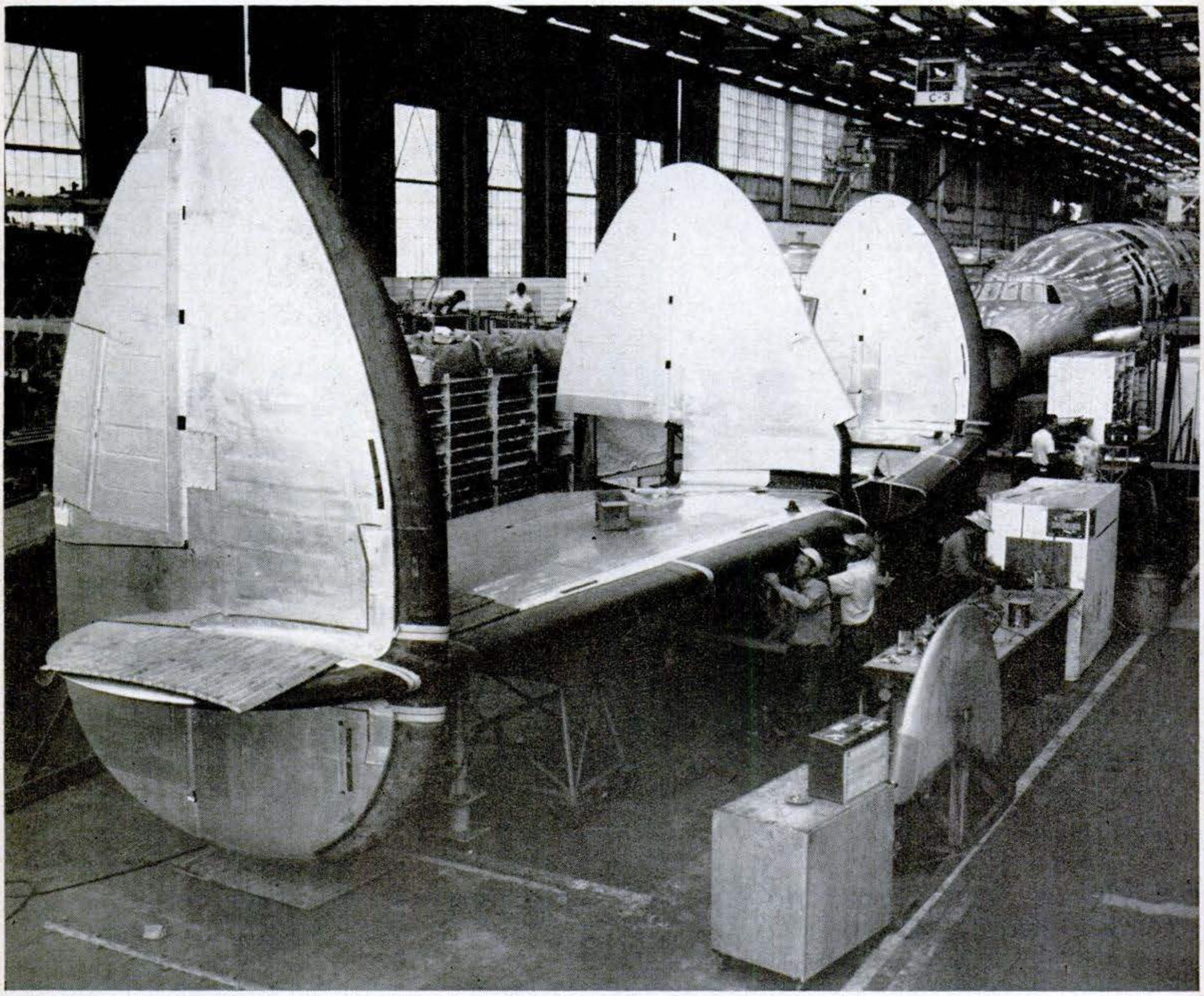


SCULPTURING MACHINE gulps aluminum-alloy slabs weighing 3,200 pounds. They come out slimmed down to a mere 389 pounds. Job of this skin mill is to rout metal from slabs that will become self-reinforced wing sections for Super Constellations.



TWO-STORY JIGS support fuselage sections upended, like tremendous barrels, for riveting. Pins sticking out of section in the foreground are fasteners that hold skin in place during riveting. Work is started on several parts of a plane at the same time. They are joined later.



TOUGH DE-ICER BOOTS are cemented to leading edges of triple-finned tail section. Giant jigs, 45 feet long, produced the horizontal stabilizer beams, panels and assembly. Completed, the tail will be 50 feet across, but so precisely made that it will fit any Super Connie.

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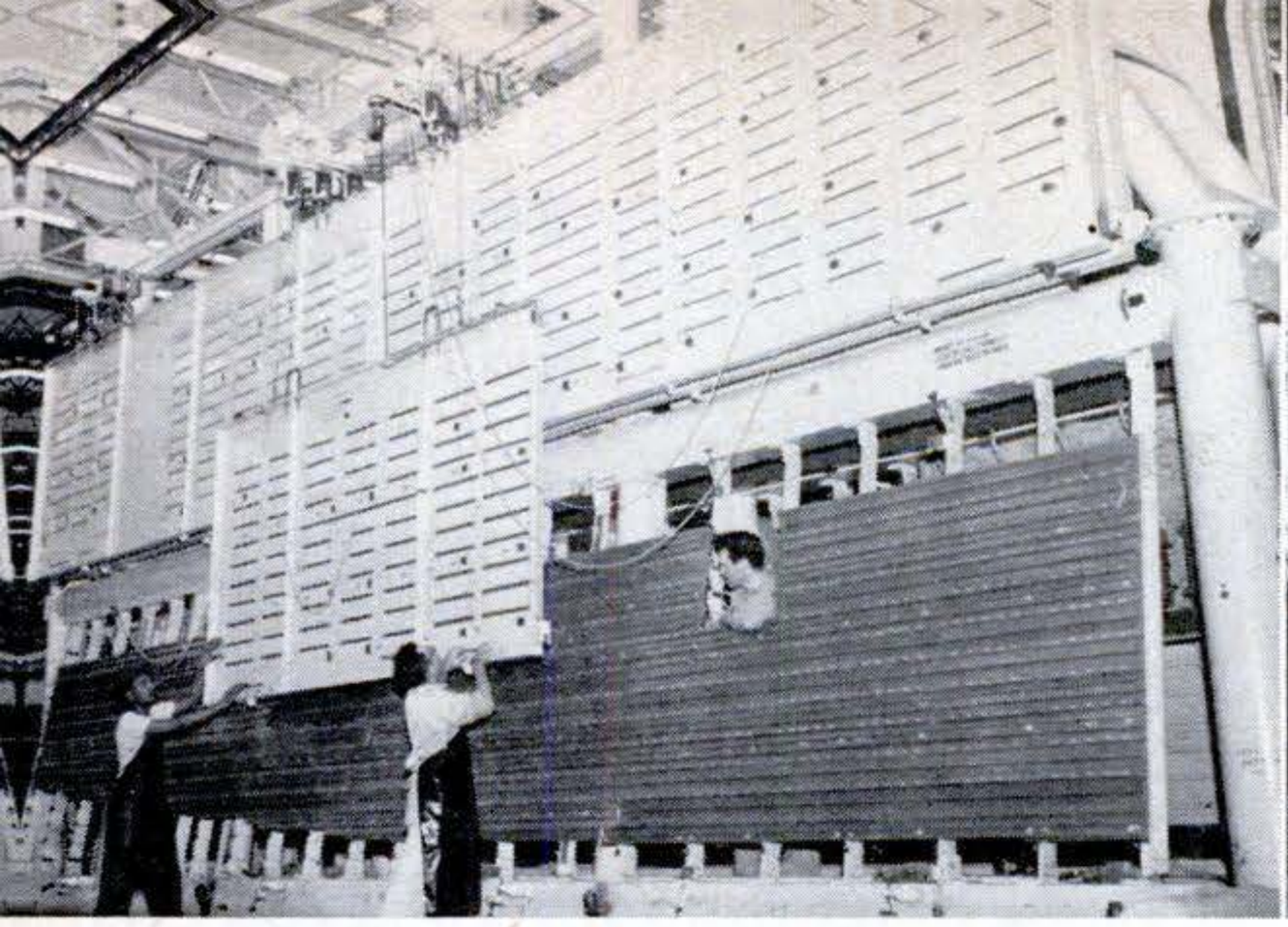
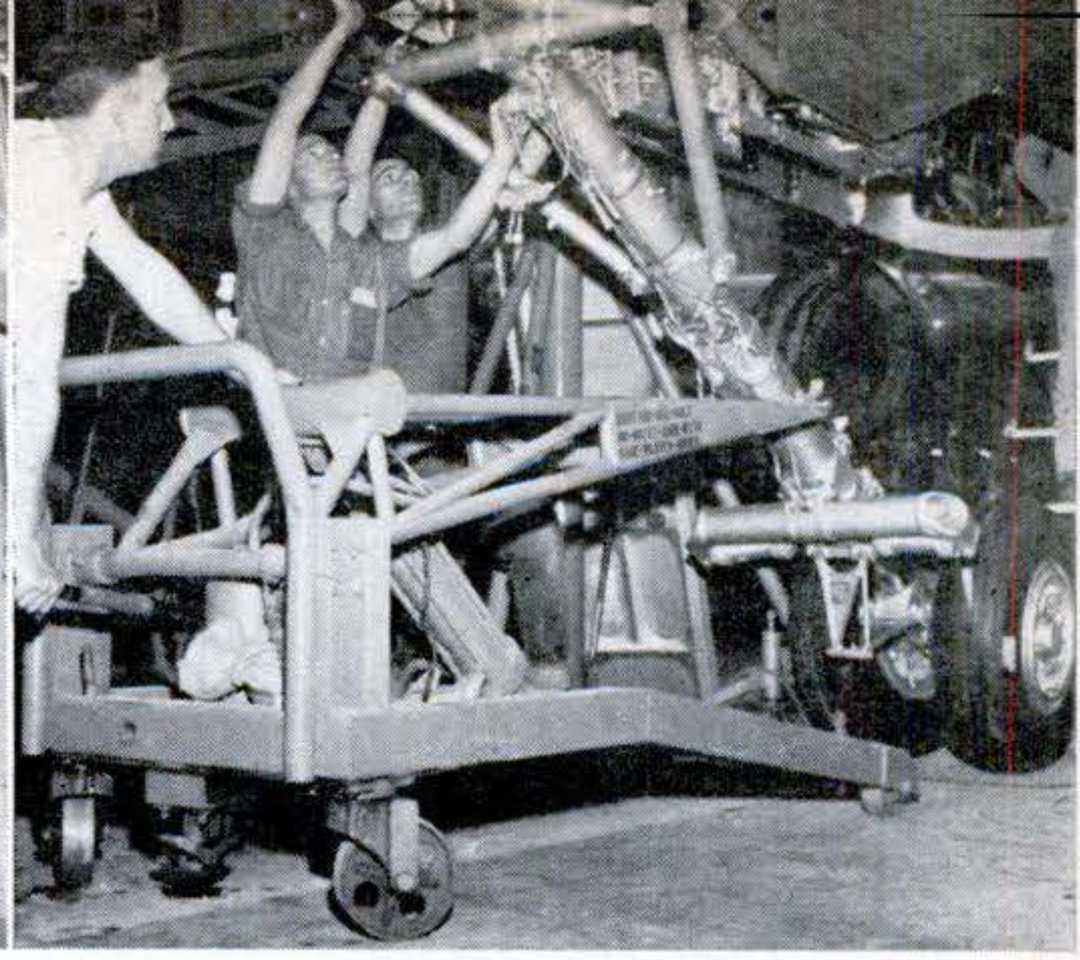
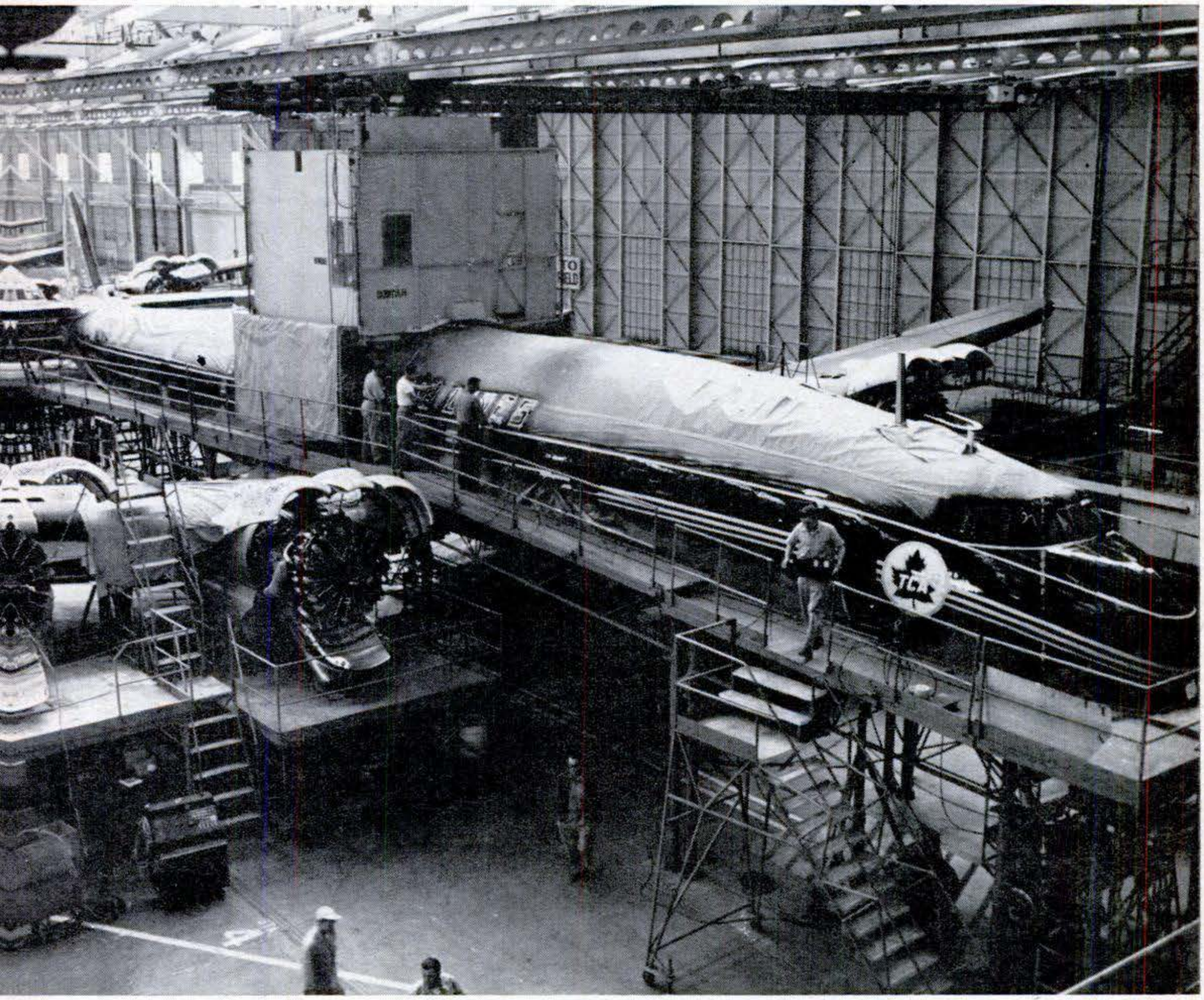


DOUBLE-SIDED DRILL JIG makes it easy to drill holes in Super Connie floor sections. Weighing 30,000 pounds, it is the largest yet built for plane-making. By drilling holes through the master plate being lowered, workers do not have to measure for drill locations.



SPECIAL DOLLY helps to install nose landing gear in a Super Connie. It hauls the big steel strut into position, then pushes the front end up to its attachment location. A hydraulic pump provides the lift while two men guide the gear's ball joints into sockets.



A MOVING PAINT BOOTH, reminiscent of the "howdah" used by elephant riders in India, crawls over a Connie fuselage. Booth makes it possible to paint plane right on the production line, saving five days, and exhausts fumes on the spot instead of at ends of building. END

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HANDSOME HOME EXTERIOR hides electric substation in Westmoreland section of Washington.

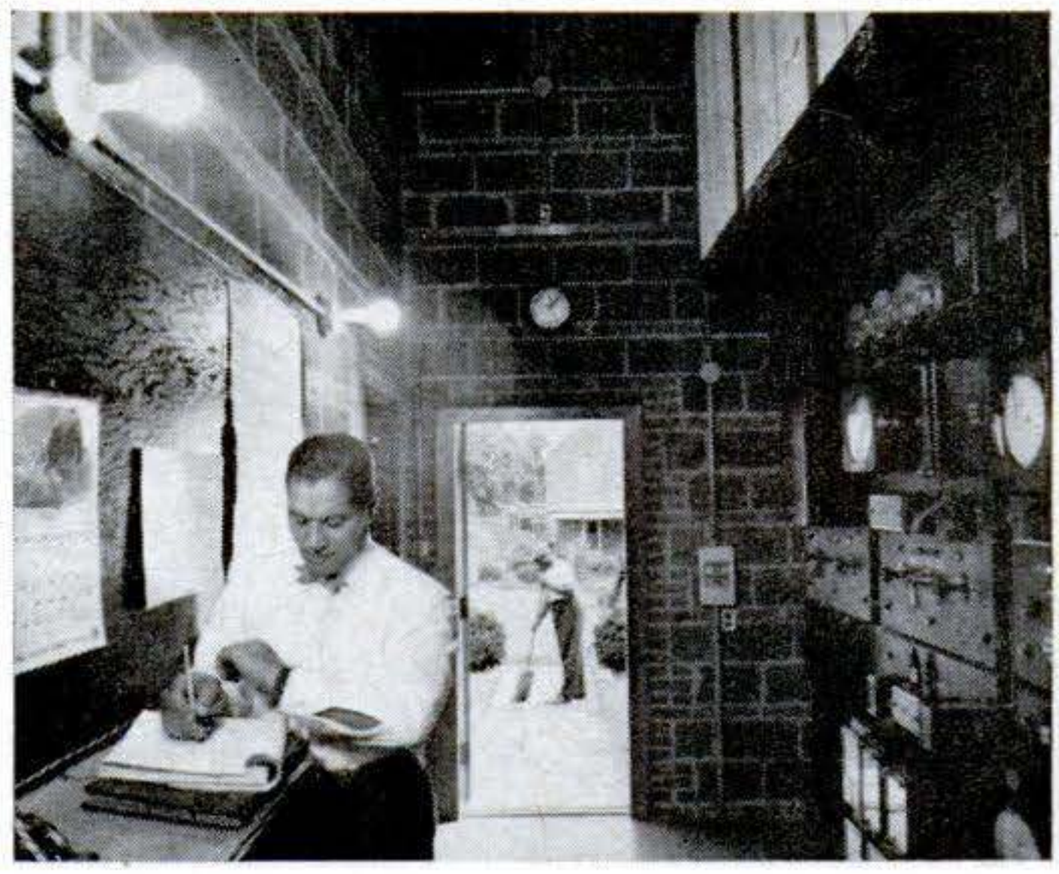
Transformers Live in Luxury Homes

SOME of the most attractive houses around residential Washington, D. C., are not homes at all. They are substations of the Potomac Electric Power Co. that feed electricity into the real homes in the capital's exclusive suburbs. These "electric" homes are designed and landscaped to blend happily with the surrounding dwellings—and so successfully that they often fool door-to-door salesmen.

Folks who live around the novel stations call the high-voltage tenants "silent neighbors." They give no late parties, have no barking dogs—and they never come over to borrow a lawn mower.

JUST A PAINTED BOARD—curtains, blinds and flowers-in-the-window are easy to care for.

HOME FURNISHINGS are transformers, switches, condensers and a maze of electric wiring.



They Say Now .....

PRESIDENT DWIGHT D. EISENHOWER: *"It is imperative that laymen grasp clearly the accomplishments of science in this century, which are certain radically to affect man's future life on earth. To communicate these concepts and advances in popular terms is the task of the science writer, and one of supreme importance to our nation. For in a democracy power rests ultimately with the people. And it is challengingly clear that those who have power must have understanding."*

DR. WILLIS J. GERTSCH, AMERICAN MUSEUM OF NATURAL HISTORY: *"The chances of being bitten by a black widow and dying from the bite are even less than those of being struck by lightning."*

PROF. FARRINGTON DANIELS, UNIVERSITY OF WISCONSIN: *"Atomic energy will come rapidly and it will have to be used in large central power stations. Solar energy will come more slowly in small isolated units."*

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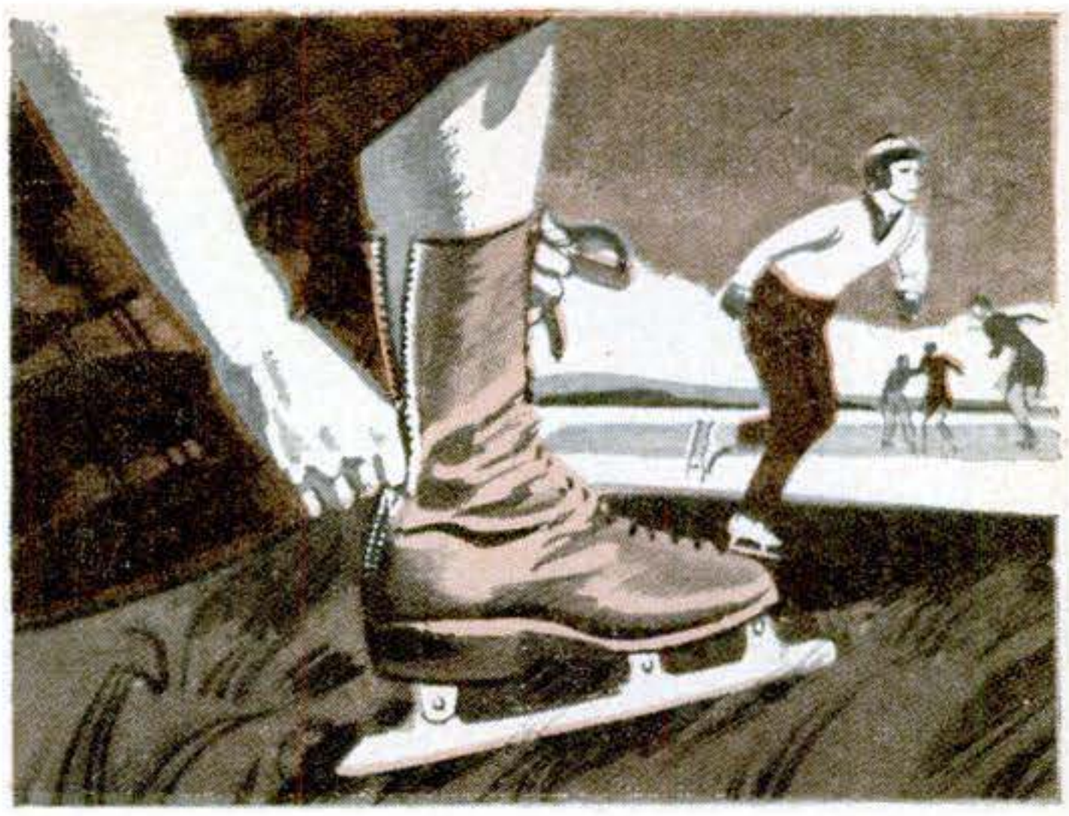
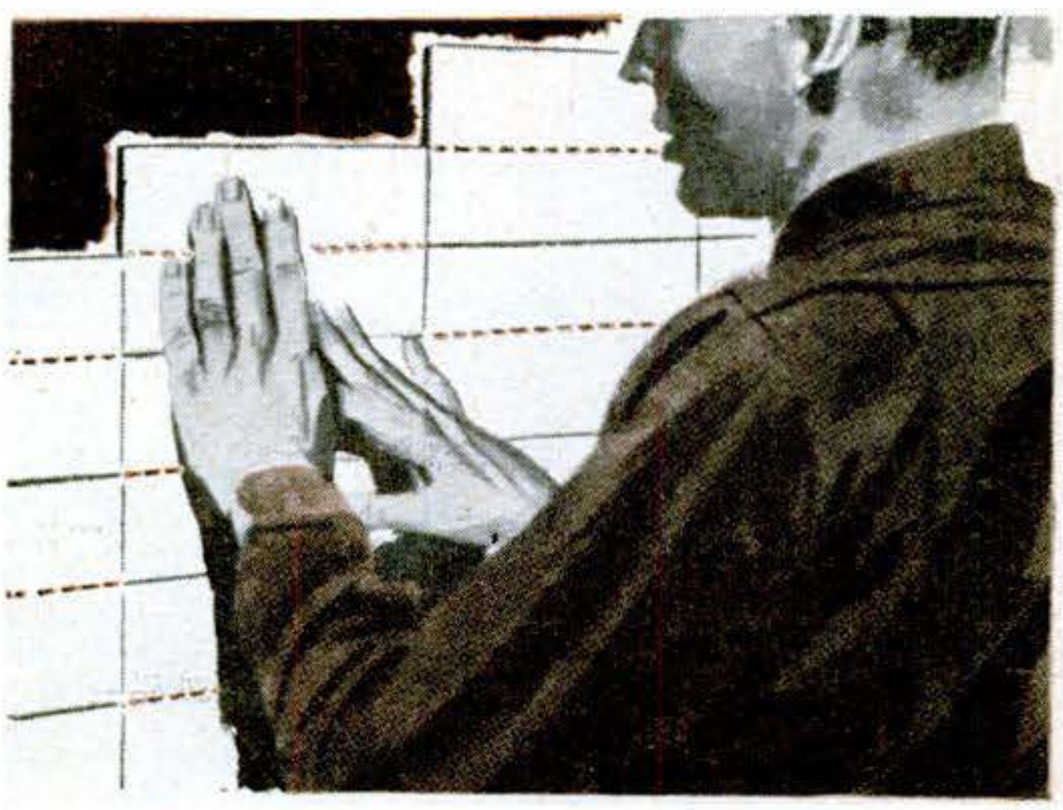
I'd Like to see them make...

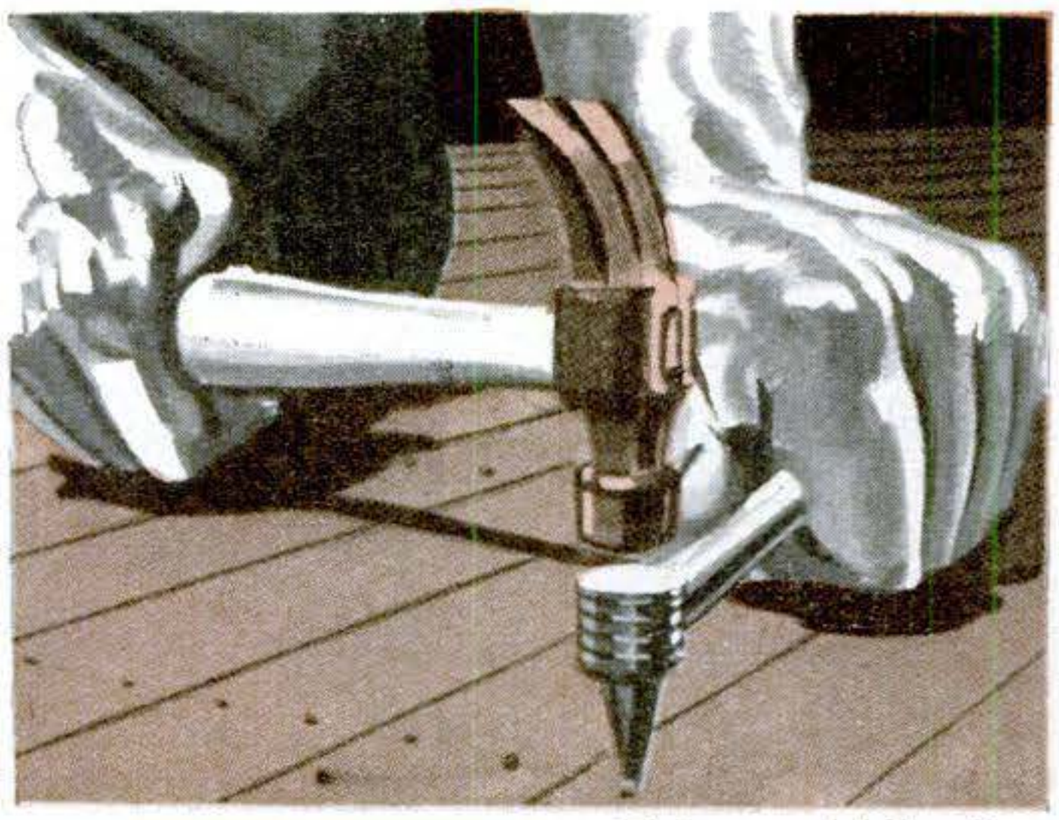


SKATING SHOES with zippers up the back and the usual laces for adjusting fit. Then you'd only have to lace them once for the season. —*Mrs. Geo. Thacker, Chesapeake, Ohio.*

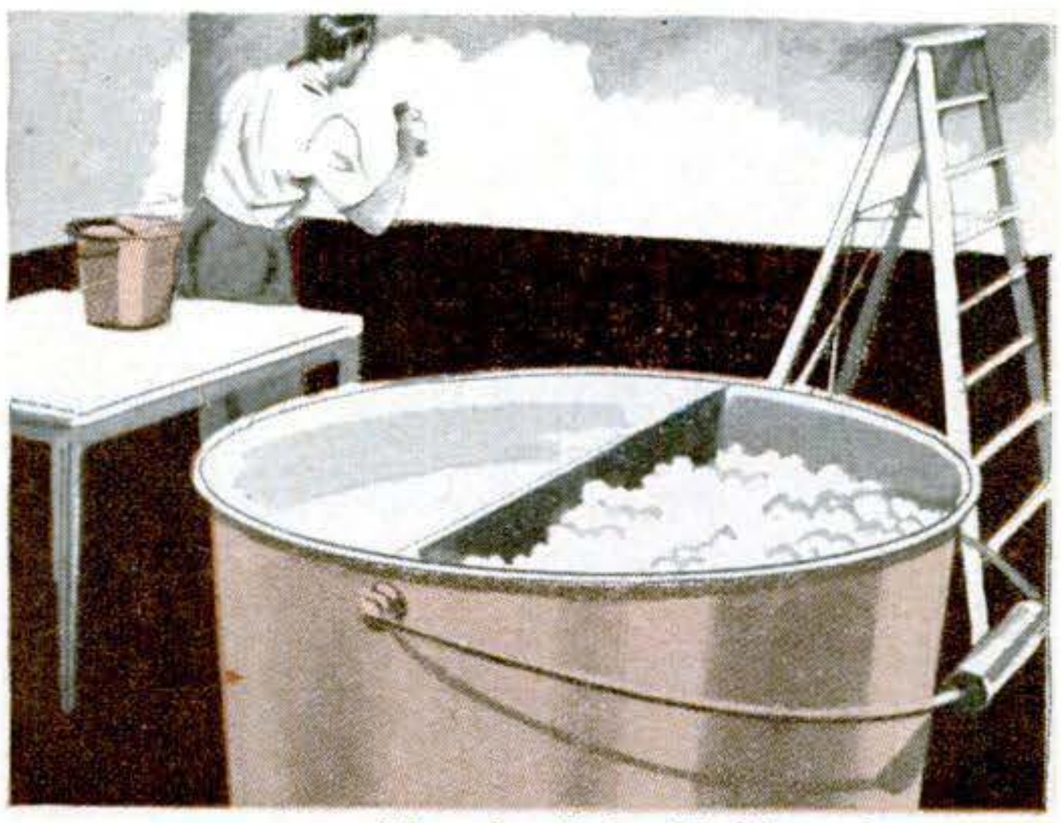
ELECTRICALLY HEATED SNOW SHOVELS so that packed snow would slide right off. If handle were wired, too, a shoveler's hands wouldn't get cold.—*Kessler Alley, Ransomville, N. Y.*



WALL TILES with a washable line dividing them in two. The halfway mark would eliminate constant measuring when tile is set in a staggered line.—*Victor Kvietkus, Chicago.*



A HORIZONTAL NAIL SET. This would be just as simple to produce as the vertical type and it would save a lot of smashed fingers.—*H. Clough, Boulder Creek, Calif.*



A SCRUB PAIL with a built-in divider. One compartment would hold soapy water for cleaning, the other clear water for rinsing.—*Mrs. H. Gruden, Ozone Park, N. Y.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE MONTHLY readers. What is *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

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"I tell you, Regan," Bert was saying as Gus came up, "I'm giving you just one more chance. I'm putting a padlock on my garage nights, and so help me—"

Gus Pursues The Little Green Men

. . . and solves the mystery of an exploding distributor cap by exploding an eerie rumor.

By Martin Bunn

WHEN Bert Hibbard first brought his 1949 sedan into the Model Garage, Gus Wilson figured that this would be one of the simplest jobs he had ever tackled. The way things turned out, Gus had a mystery on his hands, and half the people in town were talking about it and looking back over their shoulders. Some folks were quick to declare that Hibbard's distributor cap had been exploded by atomic radiation.

The car came in running rough and occasionally backfiring. Gus saw what was wrong as soon as he lifted the hood. The distributor cap was hanging loosely in the air, on the ends of the spark-plug wires and the center, high-tension wire from the coil. The two flat, spring-wire clips, which were supposed to hold the cap on firmly, were unsnapped. The cap was held in place by the stiff wires just

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enough so that the motor was able to run raggedly.

Gus lifted the cap and inspected the inside with a light. Bouncing around loosely, it had taken a beating from the revolving rotor.

Off with the Old Cap—On with the New

"Sorry, Bert," he told Hibbard. "This is going to cost you a new distributor cap. This one's had it. I wonder how those spring clips came loose. Has anyone been working on the car?"

"No," Hibbard declared, scowling. "And what's more, it was running perfectly when I put it in the garage last night. I'm ready to bet that Mike Regan sneaked in during the night and worked that distributor cap loose. You know, Gus, he's the character who threw nails on my lawn and deliberately ruined my power mower a couple of years back."

Gus knew all about the power mower. Mike Regan, a large and ordinarily well-liked and friendly man, lived next door to Hibbard. While building a new garage, he had dropped some nails on Hibbard's lawn. Mike claimed this was accidental. Hibbard claimed otherwise. The two had been in each other's hair ever since.

"Pshaw!" Gus exclaimed. "Now I don't think Mike would do a thing like that, even as a joke."

Gus Ponders a Mystery

Gus installed a new distributor cap and, while he was doing so, pondered on how those two spring clips could have come free during a night in Hibbard's garage. If the car had been all right when Bert put it away, and was running

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this way when it started in the morning, someone must have tinkered with it.

Still, the two spring clips could have jumped loose of themselves. To make sure that they didn't do it again, Gus bent them slightly, so that they snapped strongly into the niches of the cap. The car now started easily, ran smoothly.

But a week later Hibbard called the garage again, and this time he really was put out.

"Gus," he yelled into the phone, "can you come right over? Regan's been up to his tricks again. This time he smashed my distributor cap. You should see it —smashed to smithereens. I've a mind to have Regan arrested."

When Gus got to Hibbard's house, he found Bert and Mike Regan standing outside the garage, engaged in heated argument.

"I tell you, Regan," Bert was saying as Gus came up, "I'm giving you just one more chance. I'm putting a padlock on my garage nights from now on, and so help me—"

"Why blame me," Regan yelled, "when things are blowing up all over the country? It's those atomic bombs they're setting off. Why, out West the car windows are all pock-marked, and some of them just exploding. Why, I heard of a man who saw pink snow right after that last bomb they set off."

"'Morning, boys," Gus said genially, stepping out of his service car with his tool kit. "What's this I hear about that new distributor cap exploding? Sounds like a joke."

"Take a look for yourself, Gus," Hibbard said grimly.

Lifting the hood, Gus was astonished to see that the new distributor cap had literally been smashed to bits. The wire sockets hung in the air, still attached to the wires, but the rest of the cap was scattered about in pieces. This did, indeed, look like vandalism. Perhaps, Gus thought, the distributor-shaft bearing is badly worn, wobbling the rotor around so that it broke the cap. This hardly seemed possible, but Gus made an inspection for side play. There was none.

Gus straightened up, took his pipe out of his pocket. While he slowly packed and lit it, his mind was busy. Could Mike Regan have done this, as Hibbard claimed? Or possibly Hibbard had aroused the antagonism of some mechanically minded youngster in town. Gus turned to meet Mike Regan's blue eyes squarely. Then he turned to Hibbard.

"I brought a new distributor cap," he said shortly. "Maybe you'd better padlock your garage after this, Bert."

The second new cap installed, Gus drove back to the Model Garage. Several times during the next few days he saw Bert Hibbard driving the car around town. Apparently it was running well and the padlock on the garage had finally ended the matter.

"Slow down and I'll hop off here, Bob . . . Hey, Bob . . . !"

But Mike Regan hadn't been willing to let it drop there. He felt that he was under suspicion. He took great pains to explain to folks that he had been innocent. He declared that almost anybody's distributor cap might explode, even as car windows were being mysteriously pock-marked.

"Atomic radiation, my eye!" Stan Hicks, Gus's helper, exclaimed. "Somebody must have it in for Bert. It could be Mike Regan."

Exploding Cap Sets Off Town Talk

But Mike's talk went from mouth to mouth. Rumors flew. Folks dropped in at the Model Garage to question Gus about the mysteriously exploded distributor cap.

This was the situation when another distributor cap literally blew up on Bert Hibbard's car while it was sitting in his garage. This time the garage had been securely locked. When Gus got the news

[*Continued on page 246*]

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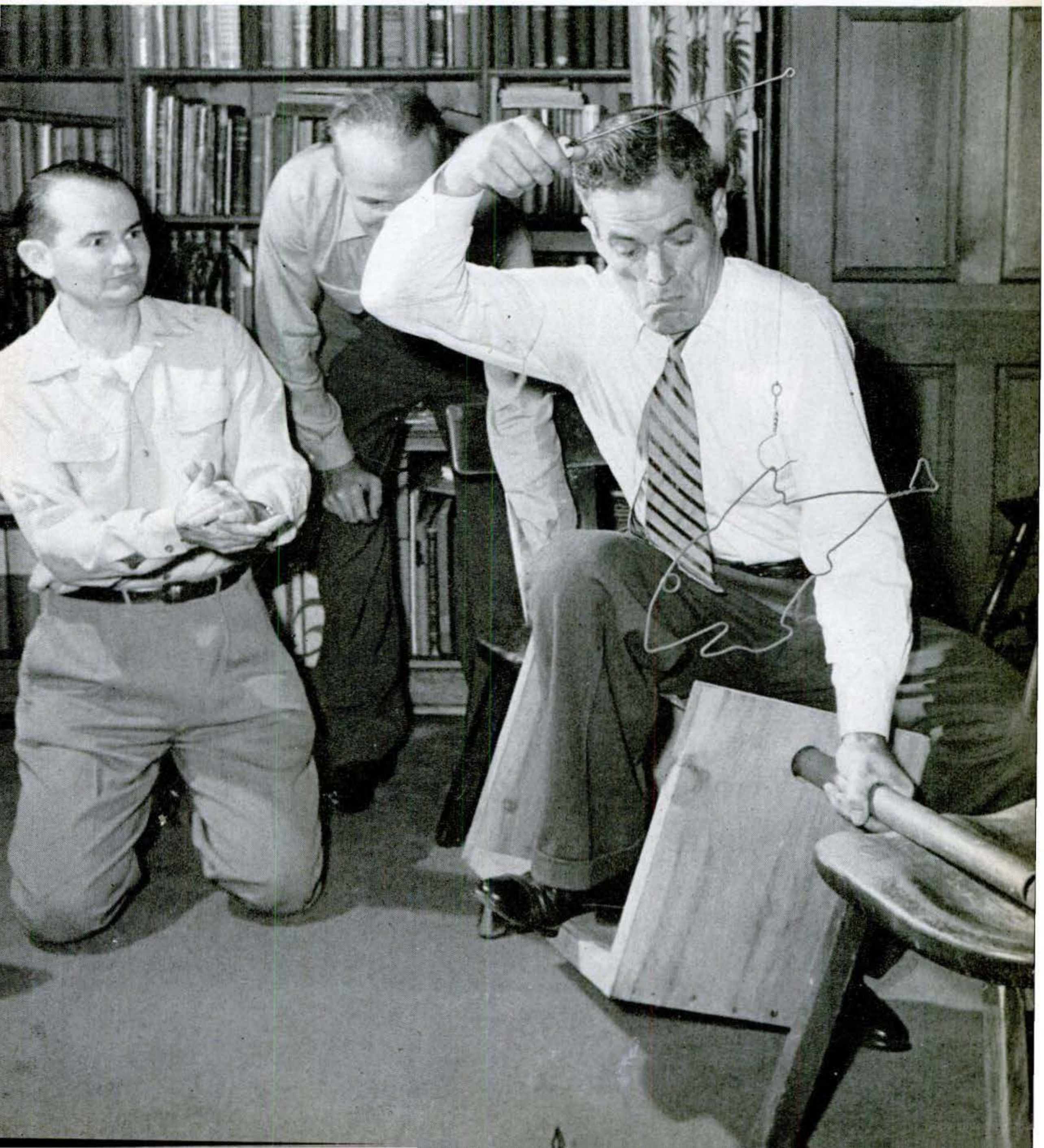
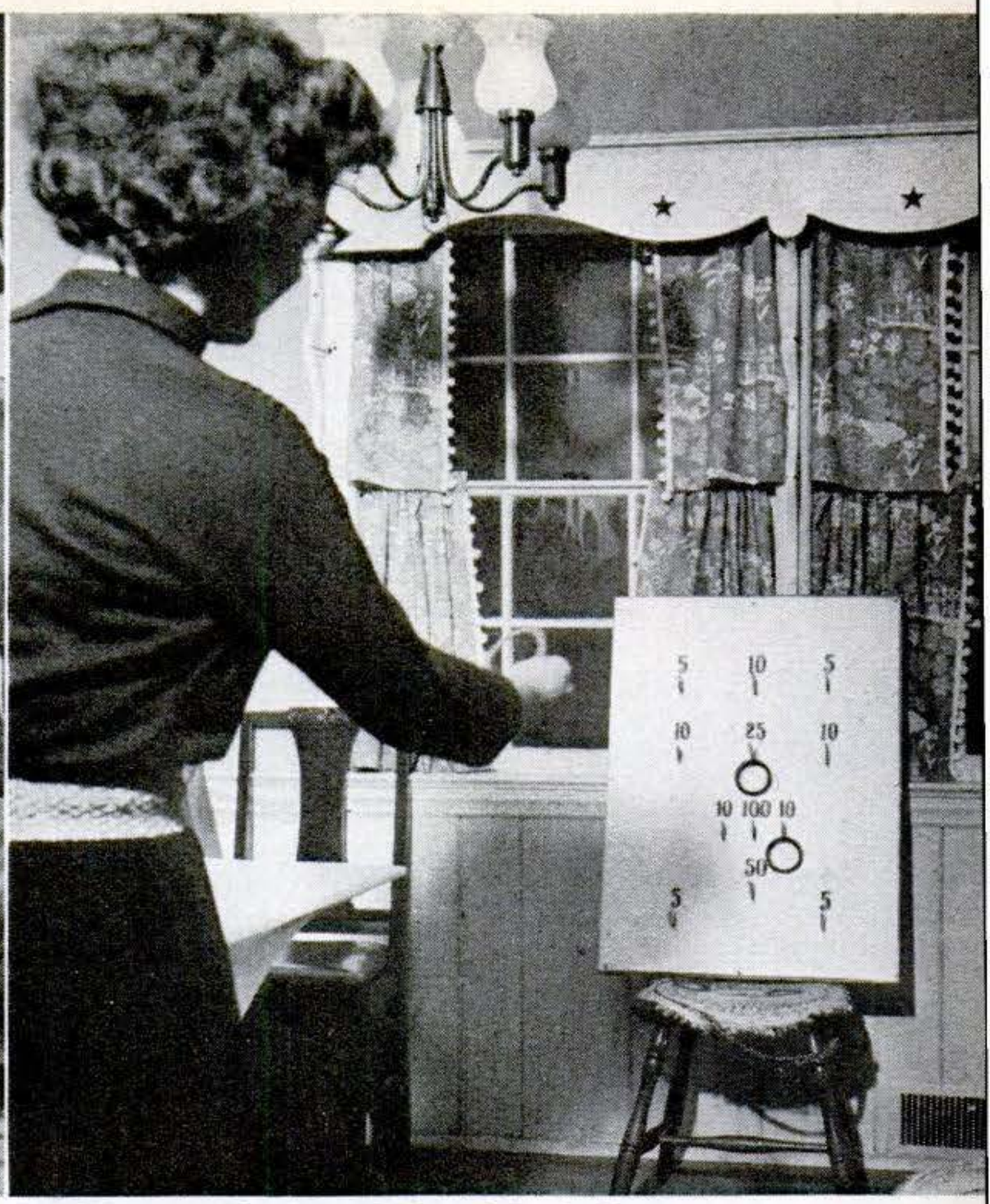
Popular Science goes to a

Coat-Hanger Party

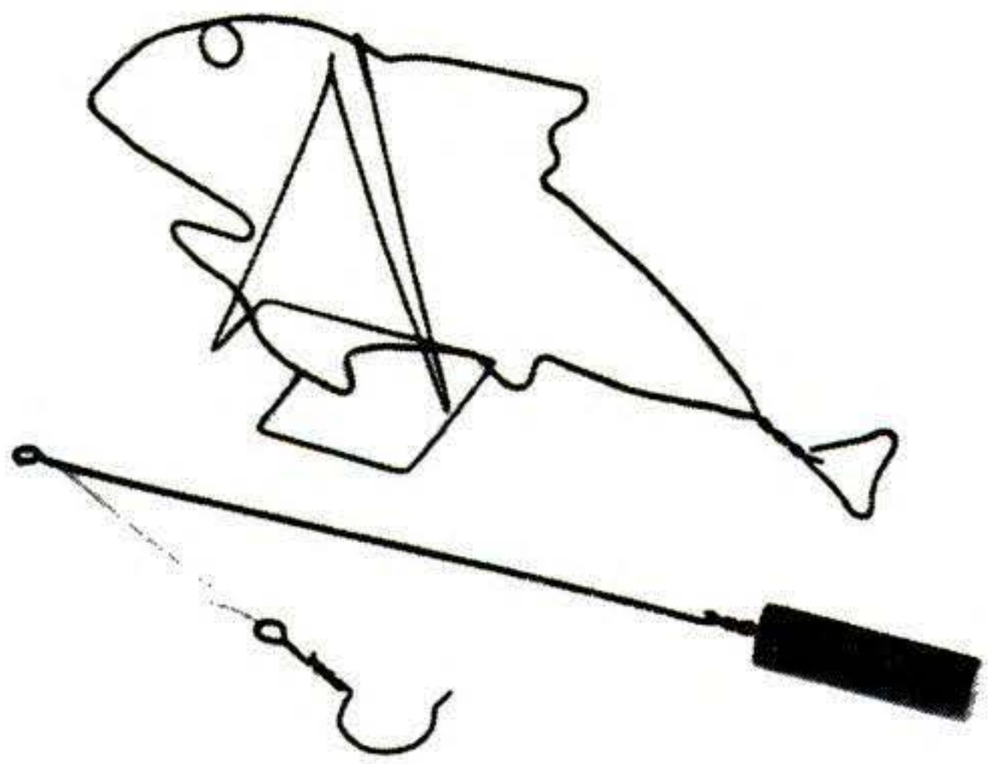
Guests meet a surprise challenge by putting a new twist on those familiar skeletons that rattle in every home closet.



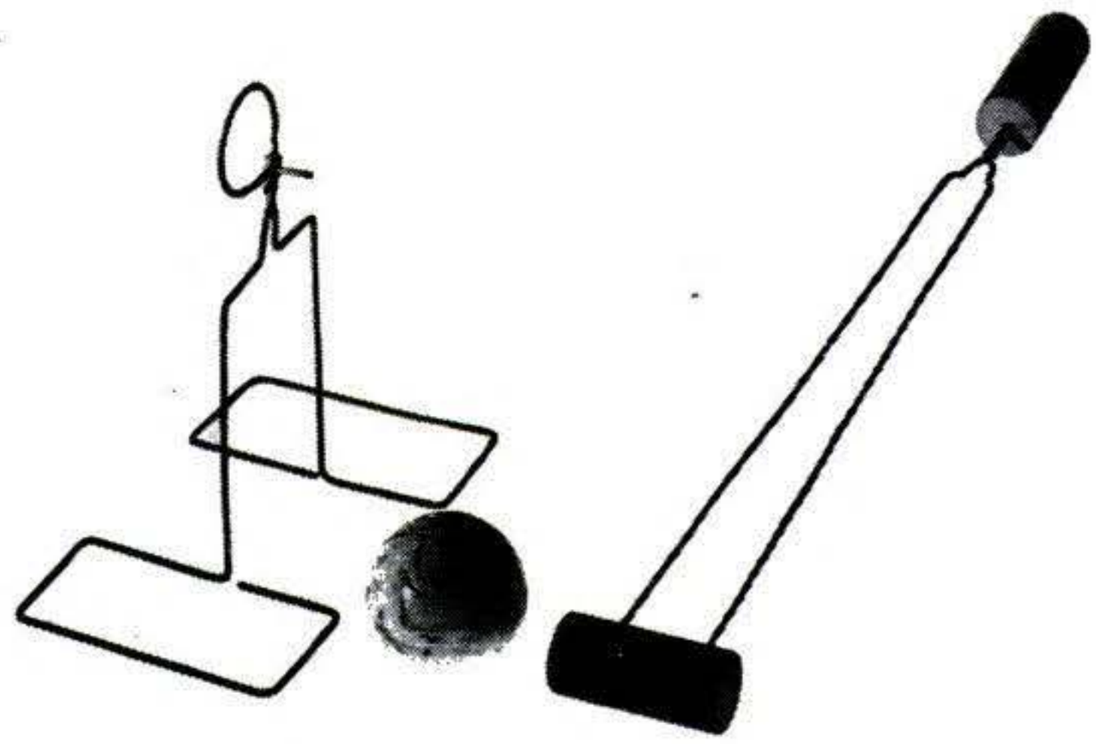
Coat-Hanger Party



HOMEMADE GAMES that made use of hanger wire helped put guests at ease in the opening hours of novel party given by the Henry Comstocks. At the left, Monique Agnieray tries to hook a coat-hanger fish while balancing in a box that was free to turn on a clothes pole. Above, Jolie Luckett aims fruit-jar rings at coat-hanger hooks in plywood ring-toss board.



WIRE FISH, stand to support it, pole and hook were shaped from hangers for the fishing game at top of page. Fish was formed from a single hanger, the hook becoming the tail.



EQUIPMENT FOR CARPET CROQUET (facing page) took only a few minutes to make. Each wicket was bent from one hanger. Pieces of 1" dowel were used for head and handle of mallet.

EIGHTEEN puzzled people in Rockland County, N.Y., recently got cards inviting them to a "coat-hanger party." When they arrived, host Henry B. Comstock gave them wire coat hangers—some straightened, some not—and put up prizes for gadgets made from them.

With pliers, hammers, bending blocks, tin shears and soldering equipment provided, the guests turned ingenuity loose to produce such diverse things as kitchen aids, candlesticks and mobiles. Between tries, they played games with equipment made of coat-hanger wire.

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MOST POPULAR GAME of the evening was carpet croquet, played exactly like the lawn version. Here, Lillian Faivre adds an unscheduled hazard by blasting at the ball with the fireplace bellows while Capt. Ray Agnieray tries to tap it through wicket. Before evening was over, the guests tired of the rubber ball and substituted walnuts to make game more sporting.

In any home where people send clothes to the cleaner, wire hangers multiply like rabbits (manufacturers turn out 300 million a year). Empties clatter to the closet floor when you hang up your pants. Bound bundles dangle from cellar and garage walls. Loose ones form a tangled mass or, crumpled and thrown away, take over the trash can.

Perhaps because they are so common, and cost nothing, coat hangers have mothered more inventions than necessity. Every day's mail at POPULAR SCIENCE MONTHLY brings more ideas for using

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that 42″ length of black-enameled wire. Hat, towel and shoe racks, cake coolers, funnel and test-tube mounts, plate hangers, watch holders, trellises, and glove, sock and fishline dryers are examples.

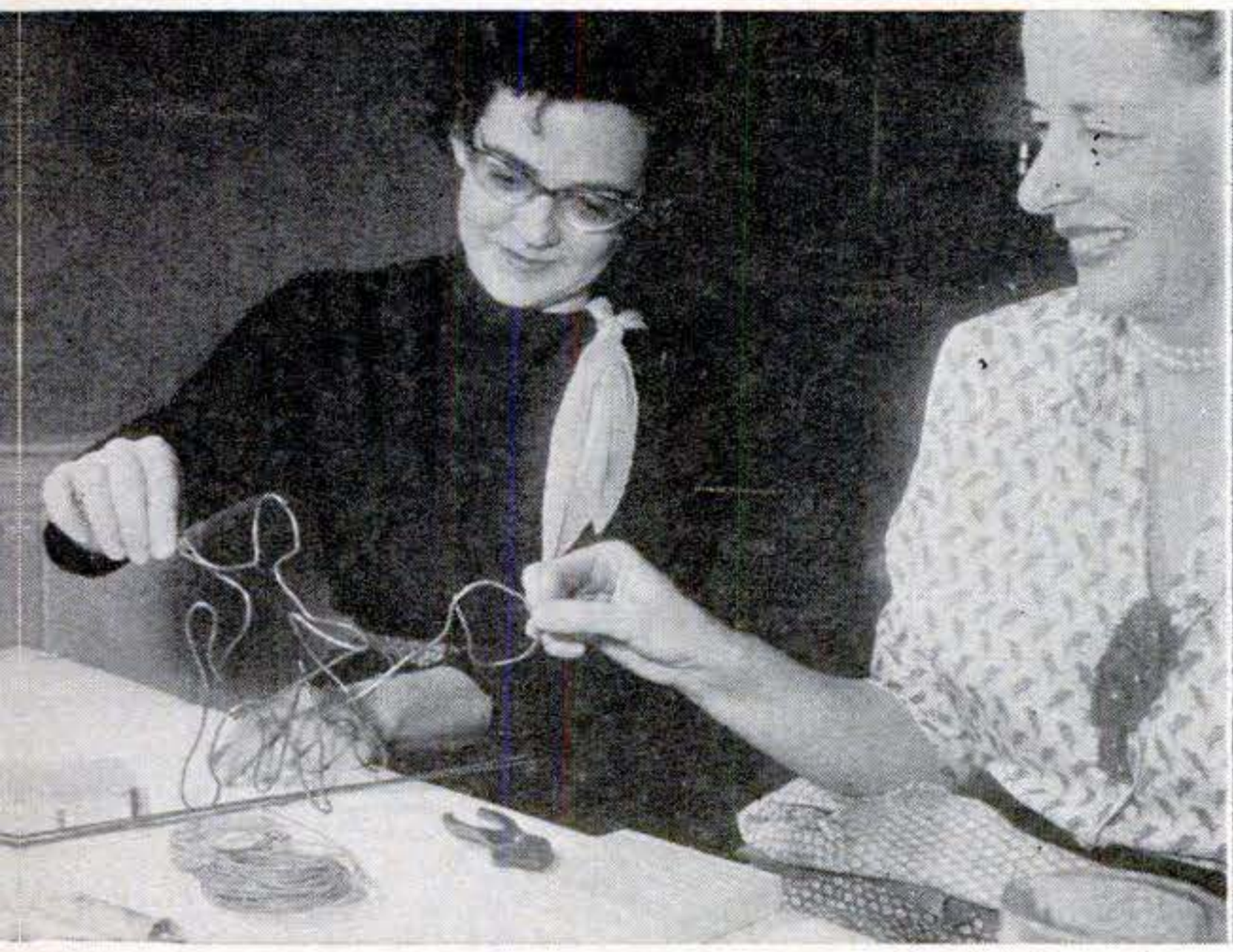
It was this that gave Comstock, PSM writer and artist, the idea for the party. To make the wire easier to bend, he tossed bundles of hangers into a bonfire. When they were cool, he cleaned the wire with steel wool.

A supply of colored tape, cement, ribbon, beads, thread and bits of dowel drilled to fit the wire helped trigger ideas in the contestants. But Comstock still isn't sure what there is about a coat hanger that arouses the inventor in most people—unless it's the challenge of the question mark at the top of each one.

Assembled around table, guests twist hanger wire in a contest for the evening's prizes.

BUT IS IT ART? A mobile is a natural clothes-hanger project. So Ruth Latham and Monique collaborated on "The Spirit of Wash Day," using clothespins and other household stuff.

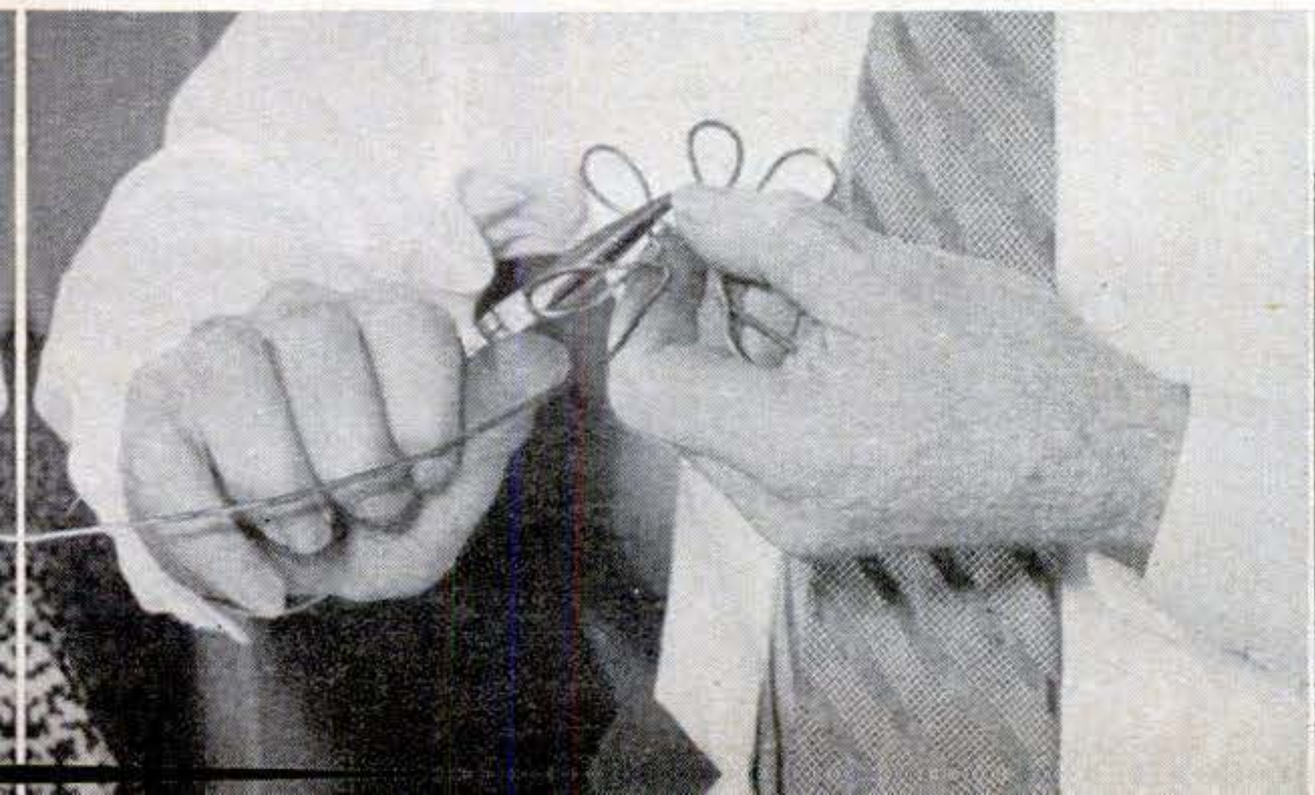
USE 'EM FOR HANGING. What more appropriate way could you use a hanger? Frances Burton and Ruth Latham strip off their nylons, drawing a laugh from others with reverse twist.

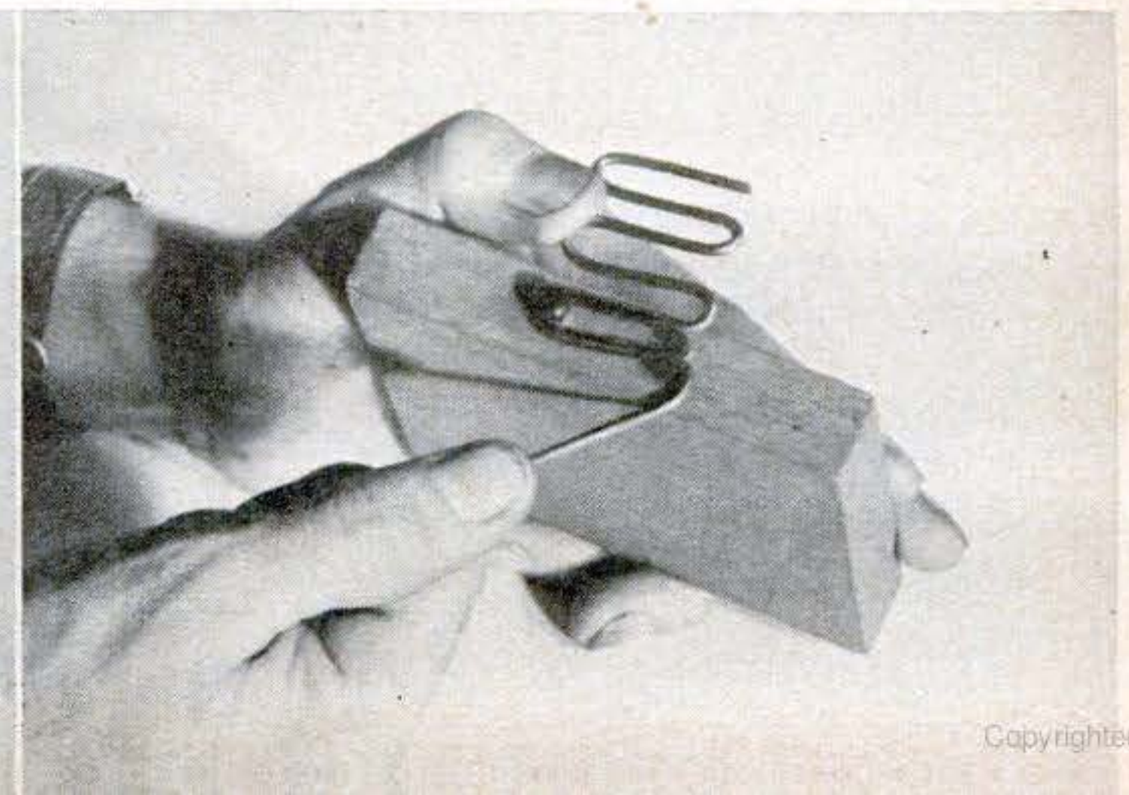


TWISTS AND TURNS OF WIRE go in all directions as the party gets into full swing. Asked to name this contraption, Jolie Luckett and Marie Agnieray called it "a man on a horse."

THE LIFE OF THE PARTY, Ruth Latham models the comic opera spectacles she whipped up with her own little hands. This was done freehand, not even a pair of pliers being required.

TOOLS FOR THE PARTY included about 10 pairs of pliers and the handy bending block shown at the lower right. Guests found the long-nosed radio pliers below most useful. Bending block was made by driving three pins into a piece of wood, two of them close together, the third a couple of inches away to provide leverage. *(Please turn the page for more party pictures.)*





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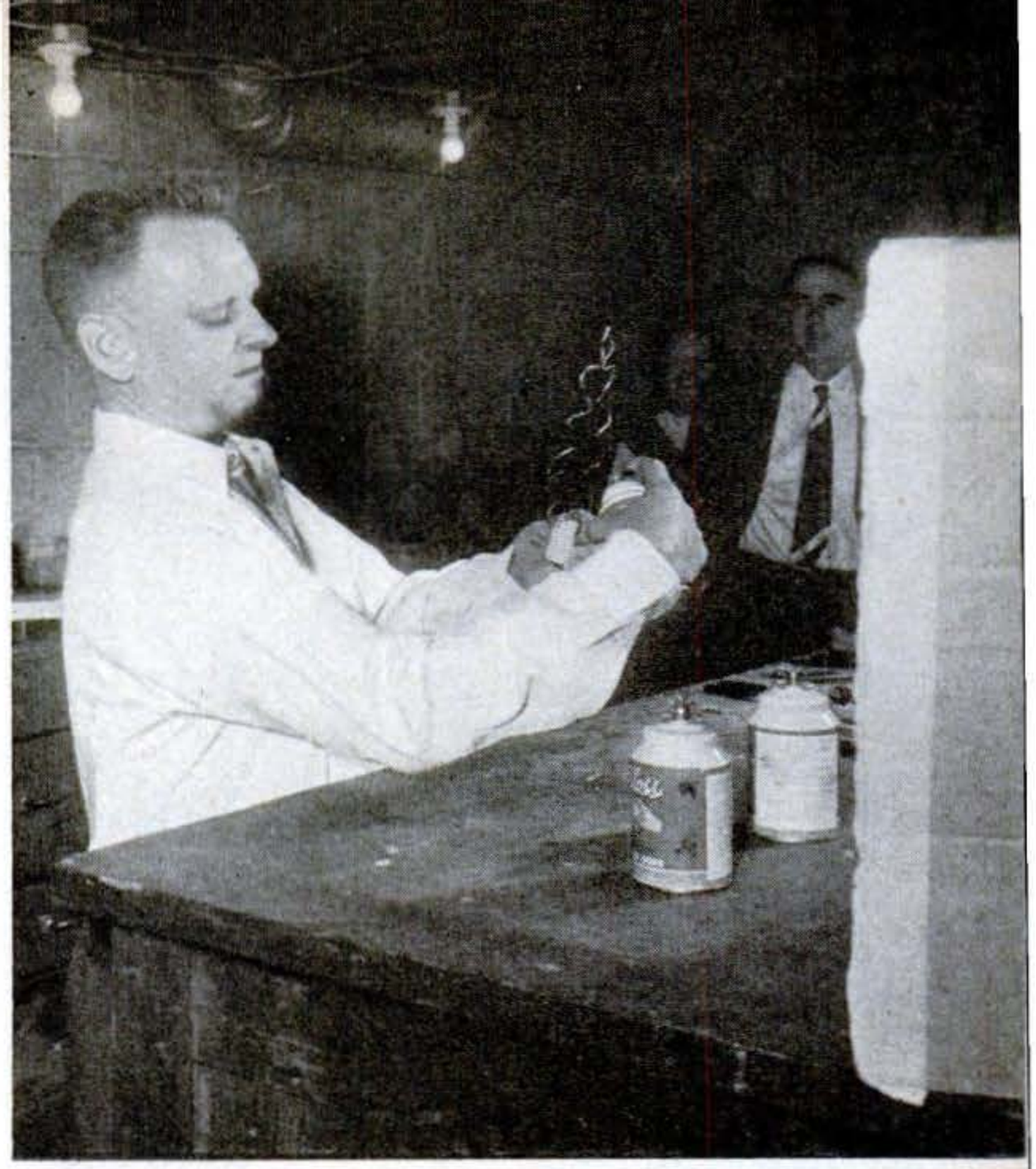
Coat-Hanger Party

MOST OF THE MEN soon moved to the host's basement shop to take advantage of the greater facilities there. Above, Host Comstock lends a hand with one of the soldering torches he had provided as part of party equipment.



NEAR MISS was observed by alert photographer as John Latham, intent on spraying his contest entry, turned spray can backward toward him-

Guests voted prizes to these three entries

FARM TRACTOR tobacco-tin holder was unanimous first choice of male guests. Ladies protested its use of supplementary material (designer Ernie Hesse had used tin for the saddle).

PLASTIC CURTAIN PULL in Lillian Faivre's planter stand was cited by men as precedent for the Hesse case. On the fourth ballot the tractor came in second, the planter third.

FIRST-PRIZE-WINNING angel candlestick kept Helen Gilmore bending wire most of the evening. Tough propane-torch soldering didn't faze her in the least.

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self. The photographer cocked his camera and waited hopefully. Sure enough, a few seconds later John unwittingly scored a direct hit on his chin and the collar of his best party-going shirt. Seconds later, his surprise was still plain enough, as registered above.

GRAND PRIZE WINNER, Helen Gilmore, applies a coat of quick-drying modelmaker's paint to her angel candleholder as Ray Faivre watches.

A JOKESTER TO THE END, Host Comstock tries to palm off some extra hangers on departing guests at three a.m. but finds no takers. END

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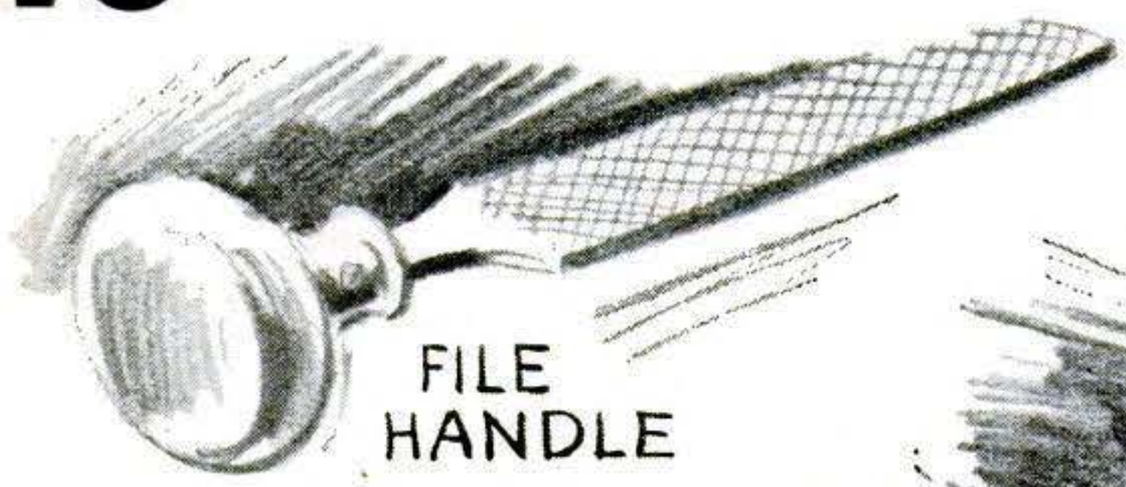
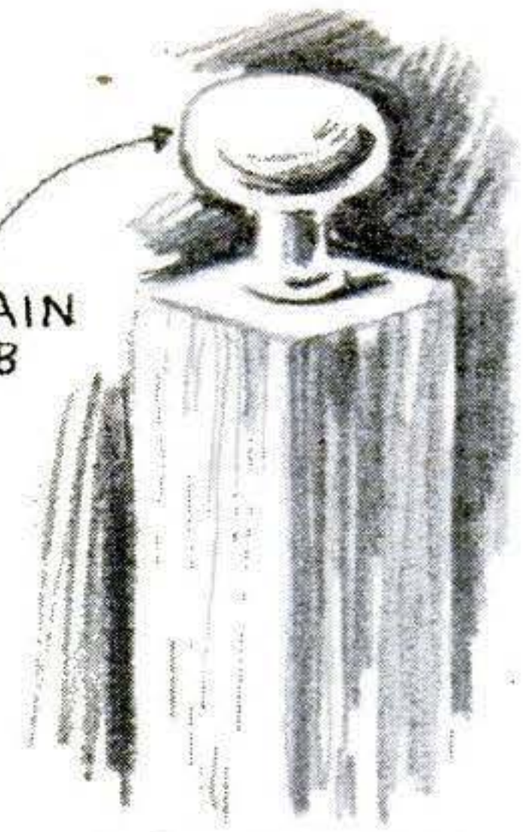
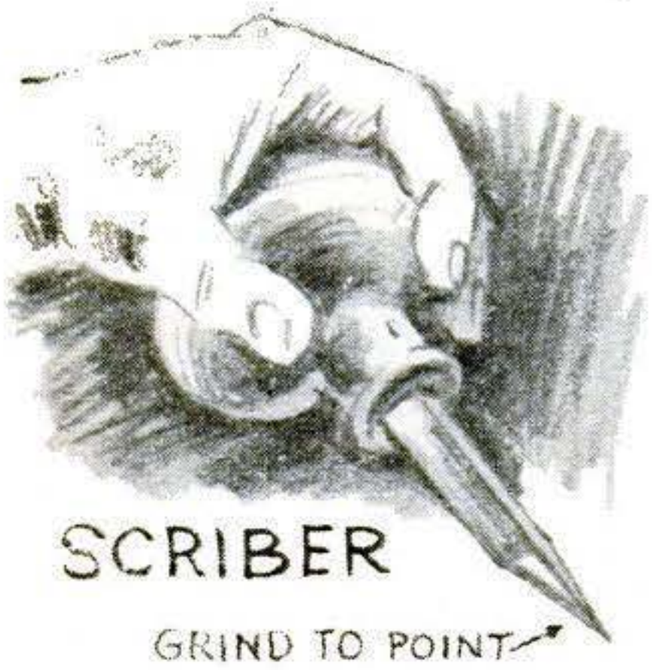
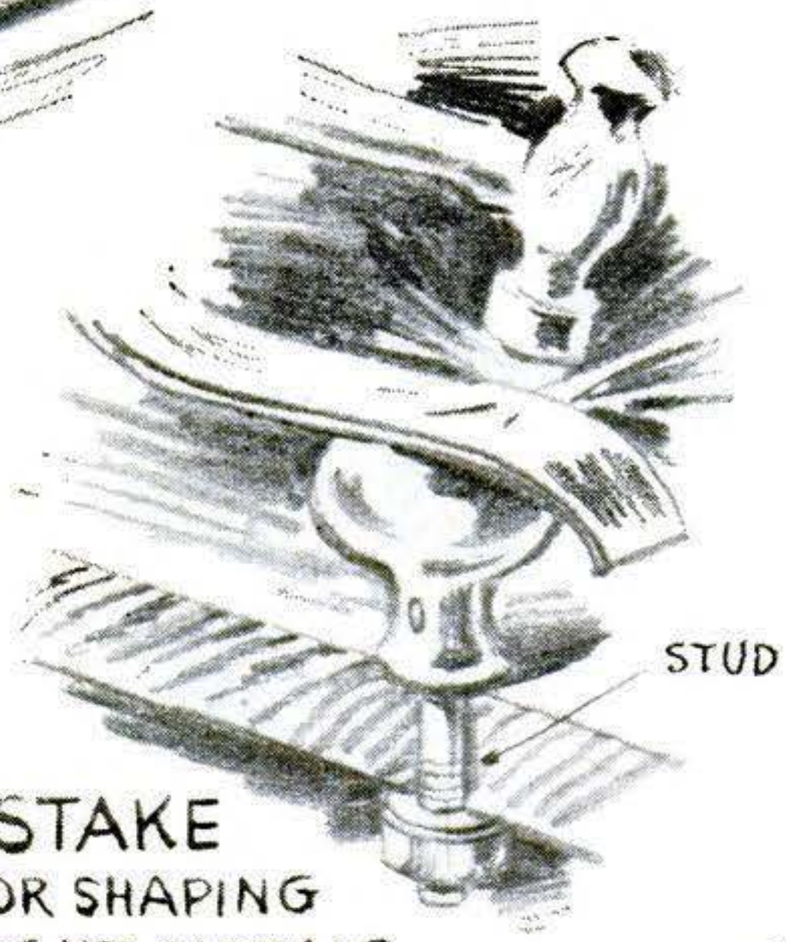
10 USES FOR Door Knobs



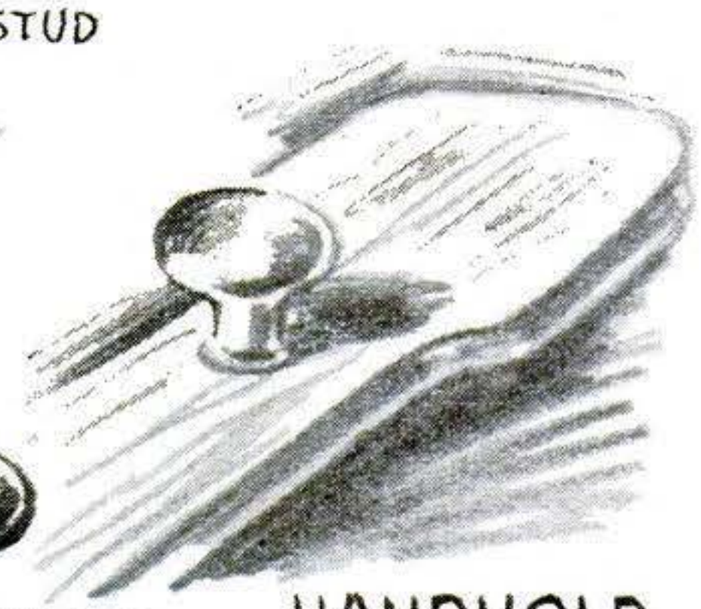


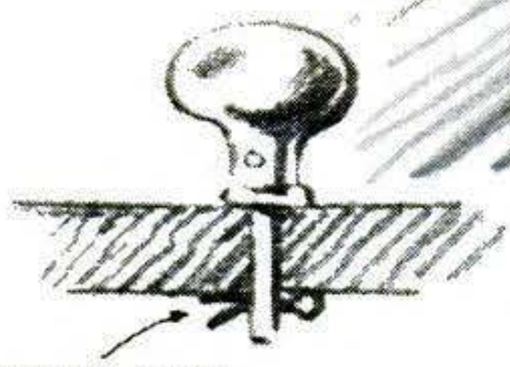
GATE-POST
ORNAMENT



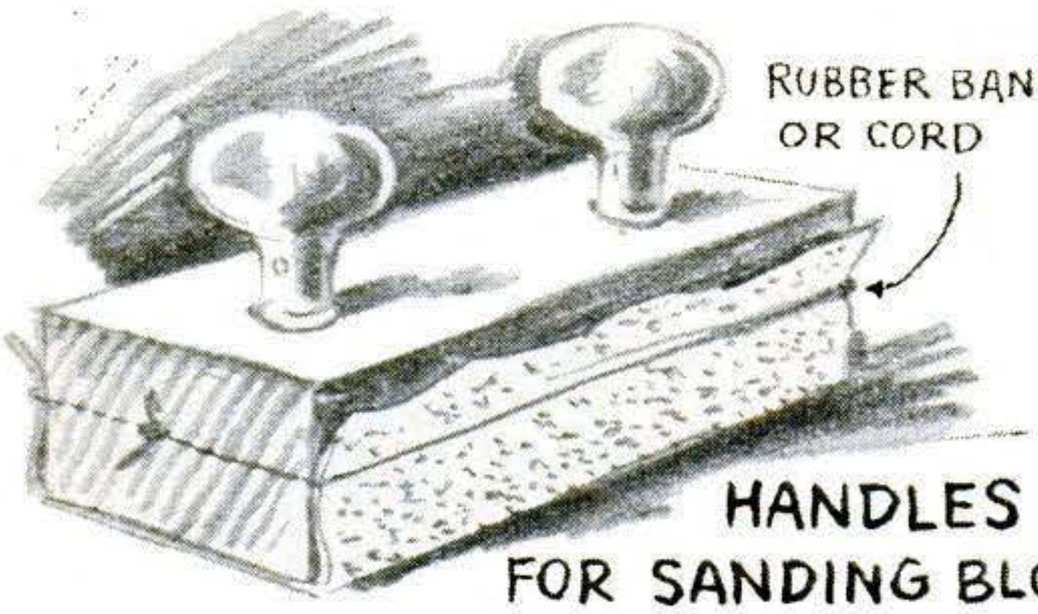


STAKE
FOR SHAPING
LIGHT METALS

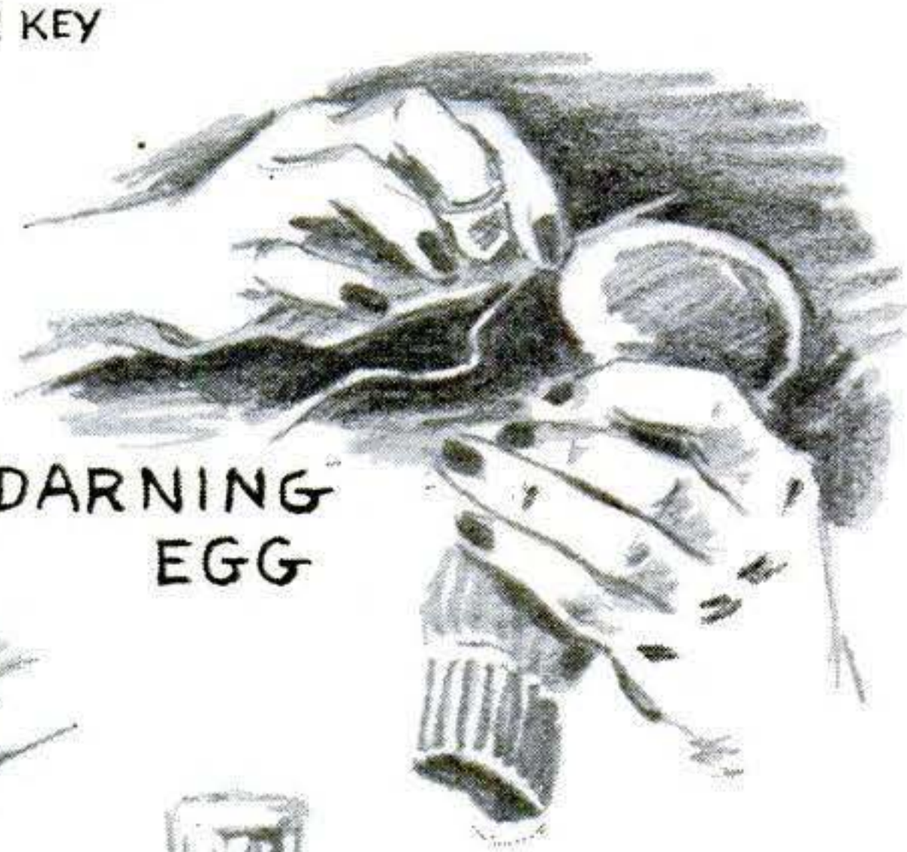




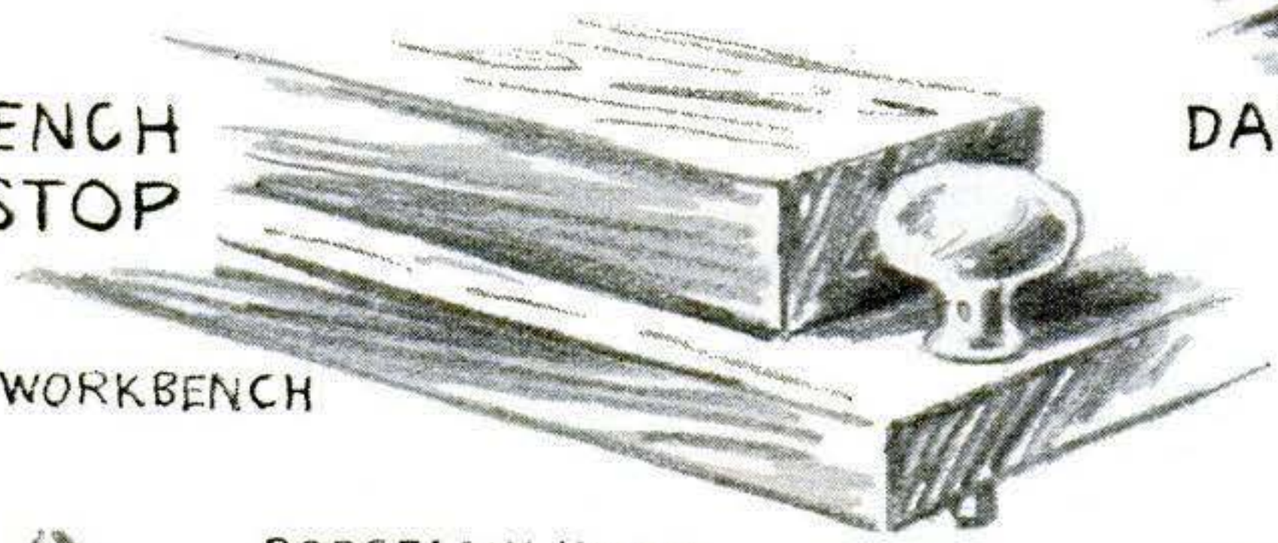
HANDHOLD
FOR SEESAW

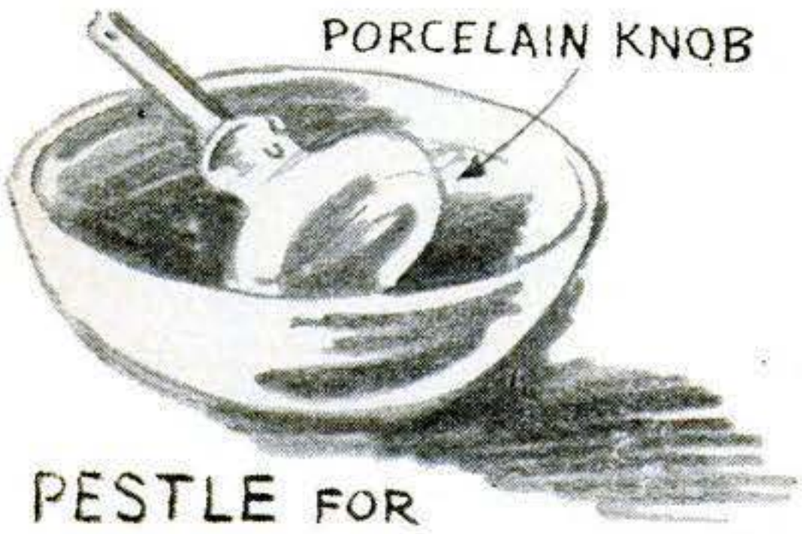


HANDLES
FOR SANDING BLOCK

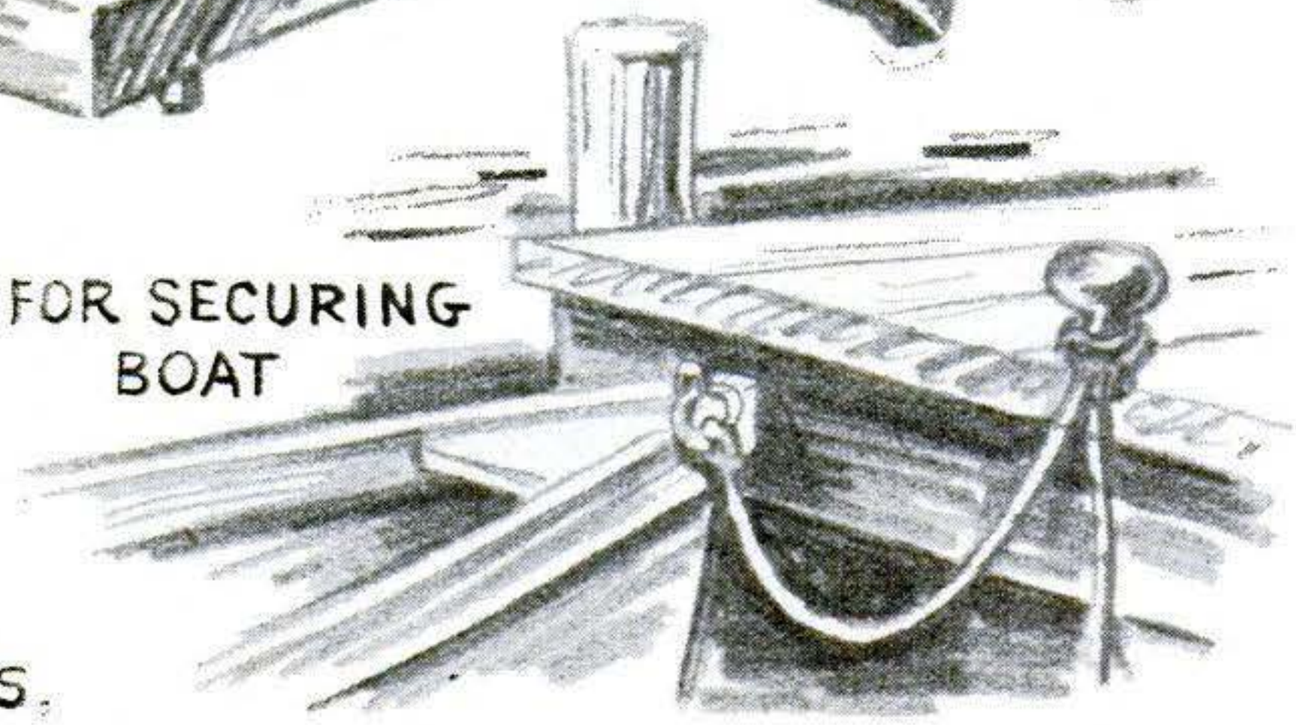


DARNING
EGG





PESTLE FOR
PULVERIZING DRIED HERBS.



FOR SECURING
BOAT

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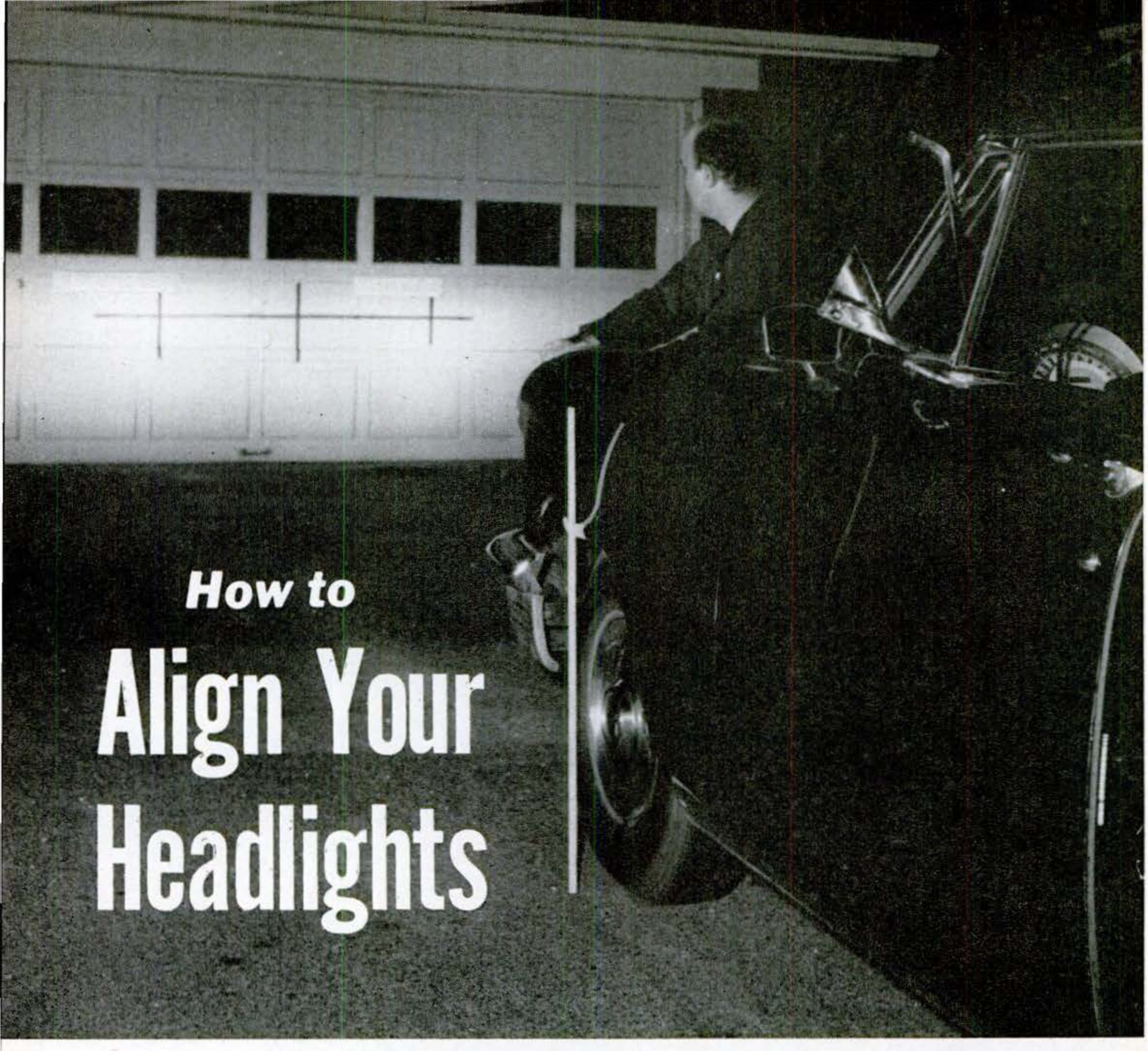

How to Align Your Headlights

Are they a glaring example? With tape and a couple of sticks, you can teach them manners in short order.

WHEN approaching cars blink their lights at you repeatedly, even though you're on low beam, you can bet that your lights are out of adjustment.

But don't bet your life—or the other fellow's. In a half hour or less some evening before supper, you can aim your headlights accurately. You'll be helping along highway safety—your own especially. And it won't cost a cent.

The high beam must reach well ahead for today's fast driving. The low beam should illuminate the edge of the road and show you curves before you get to them, even in the face of oncoming lights. Correct adjustment will give you both.

Using ordinary tape, two sticks, and a tape measure or yardstick, you can follow the steps shown on the next two pages to make that adjustment yourself. All you need is a wall or door at which you can point the car squarely. Because aiming points are marked visually, it does not matter if the ground isn't perfectly level.

One thing first: some state laws permit centering the high beam 2″ below lens center at a distance of 25′. Others specify that it be depressed 3″. Check this point with your license bureau or a reliable service garage to make sure your own job will conform to specs.

Please turn the page for step-by-step pictures

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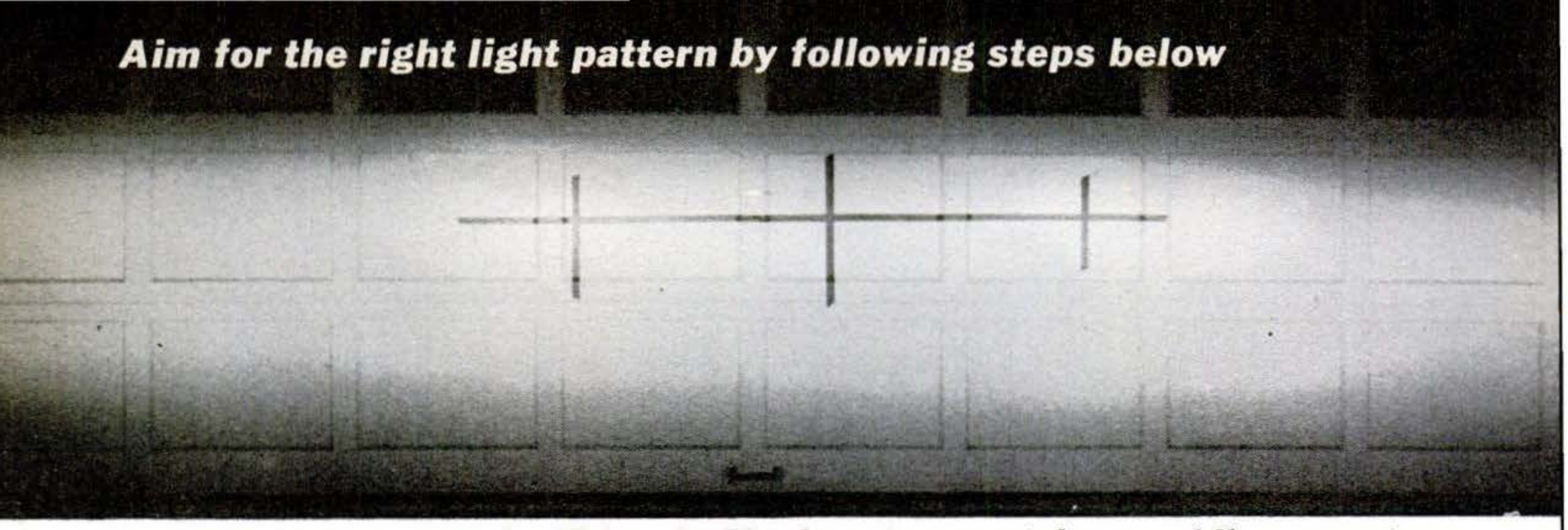
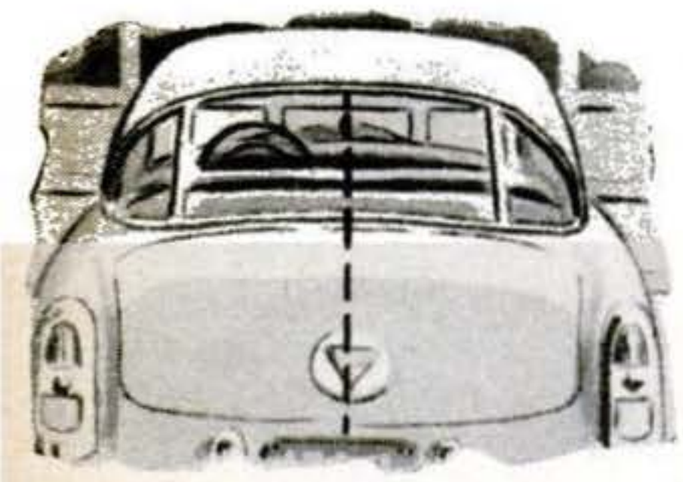
Aim for the right light pattern by following steps below



PERFECTLY ALIGNED, your headlights should form a light pattern like this. Only the high beam is adjusted. Correct aiming of the low beam is automatic because of filament spacing. The numbered steps below show how you can align headlights without special equipment.

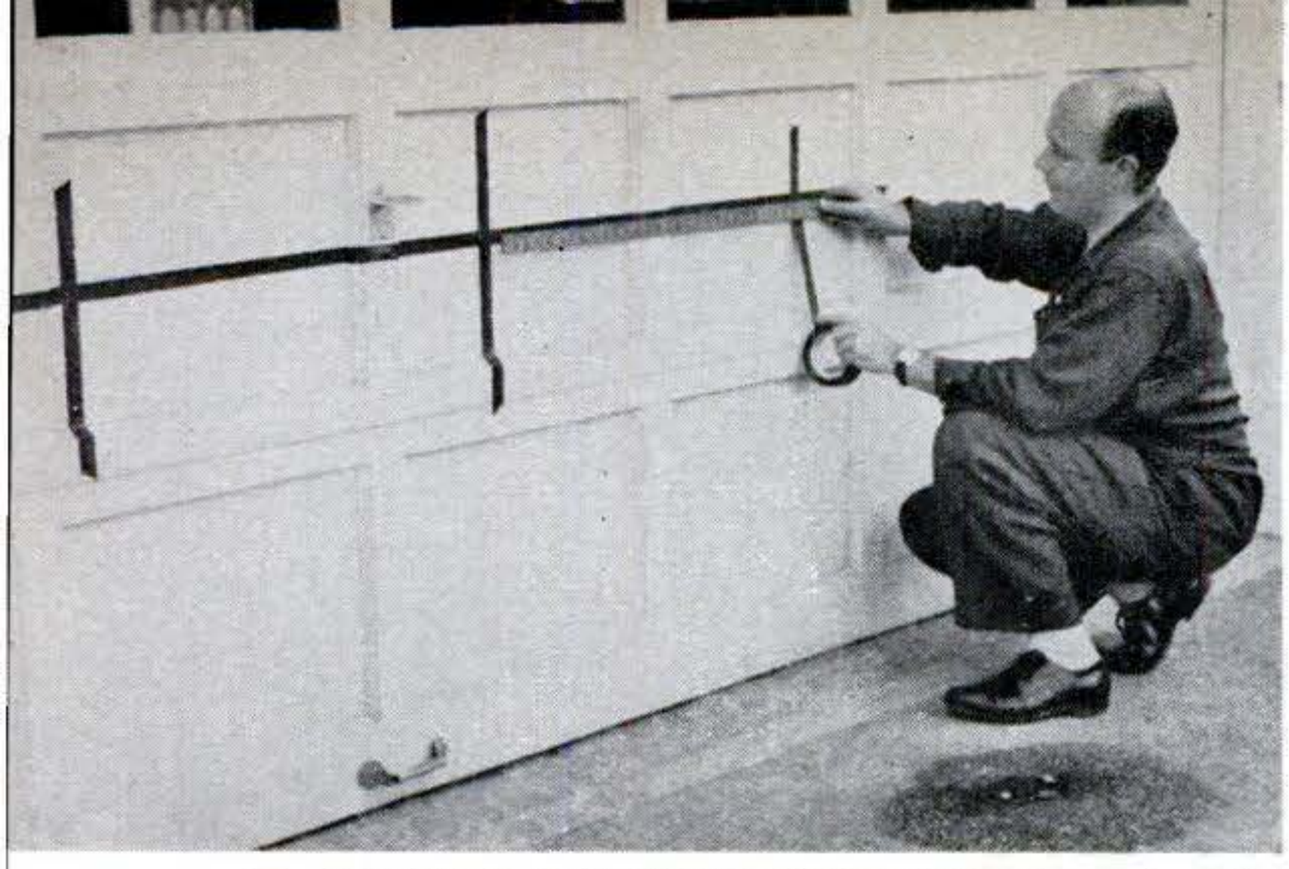
1 IN LATE AFTERNOON, while it is still light enough to see, place car squarely in front of a wall or garage door and exactly 25′ away, measuring from the headlight lenses. Rock the car a bit to make sure the springs are free, without any set. Have the car empty and tires inflated to normal pressure. Measure from the ground to the center of the headlights as above. Subtract 2″ (3″ in some states) and cut two sticks to this exact length.

2 TAPE THE STICKS to front and rear fenders alongside wheels. Sight along the tops of the sticks to establish the height of the aiming line on the wall or door. Have a helper mark it while you direct him, or stick up a piece of tape as near as you can and sight several times until you manage to get it right on the nose. Repeat with the sticks on the other side of the car. Then join the two marks to make a horizontal line across your aiming surface.



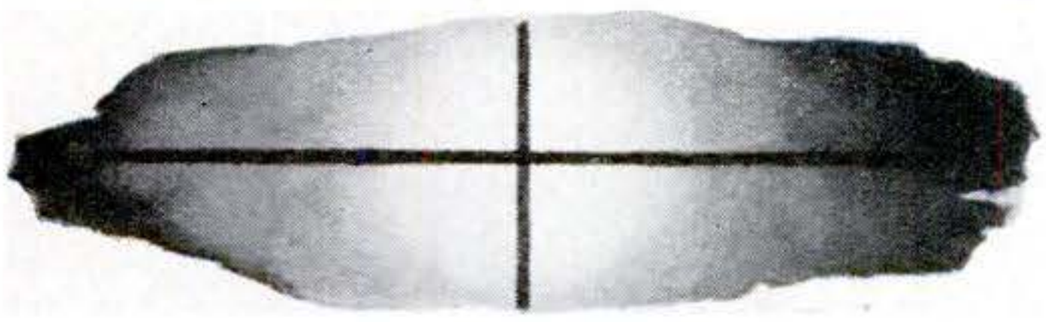
3 SIGHT THROUGH the center of the rear window and over the hood ornament or centerline to establish a center mark on the aiming surface. Stick a vertical strip of black tape there, across the horizontal line.

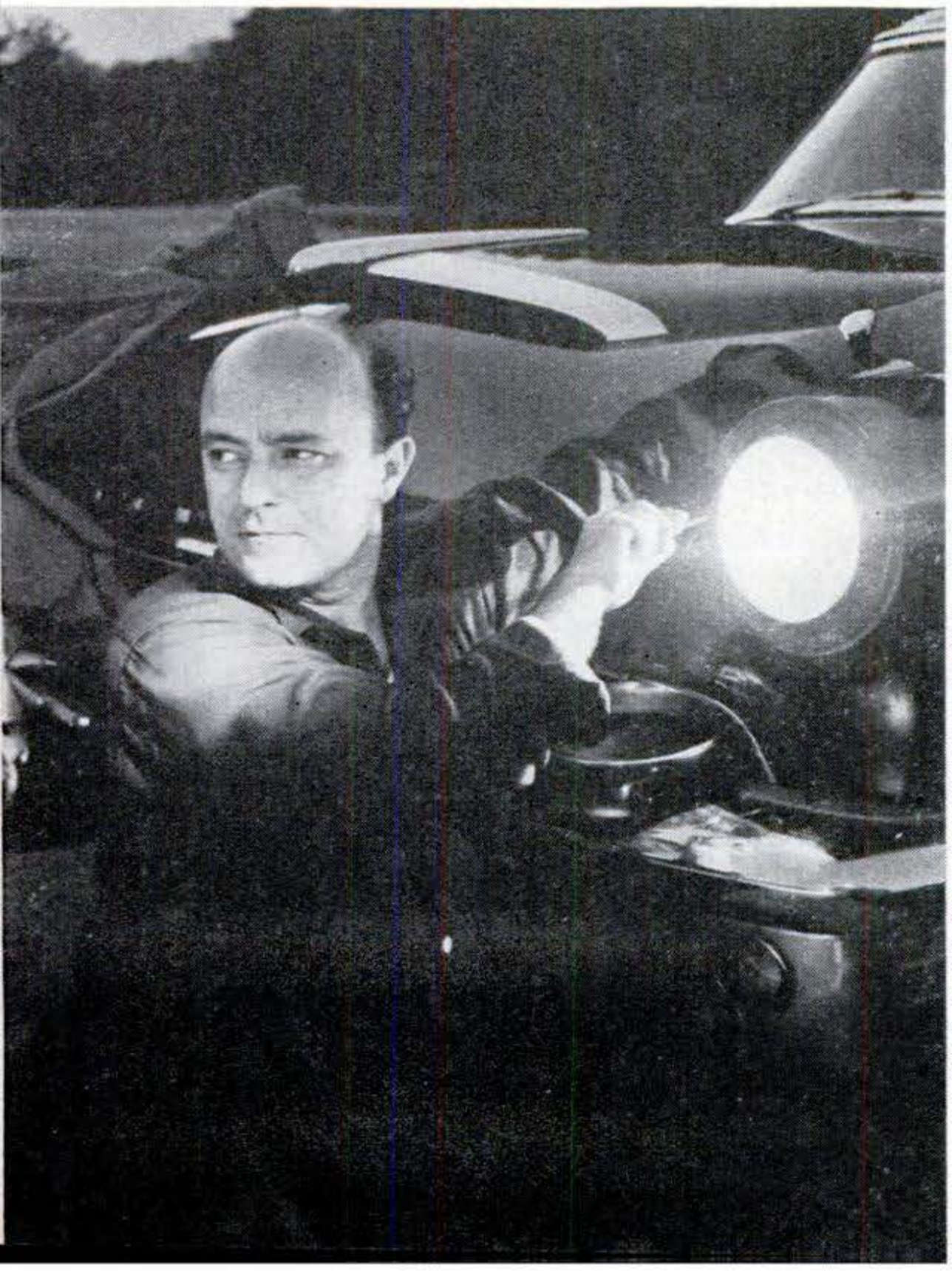
4 WITH A YARDSTICK or tape, measure the exact distance from center of the hood to the center of a headlight. If the hood hasn't a centerline or ornament, measure from center to center of both lamps and divide by two.



5 **MEASURE THE SAME DISTANCE** to each side from the centerline on your aiming surface. Stick vertical cross lines of tape at each measured point. These are aiming points for lateral adjustment of the headlights.

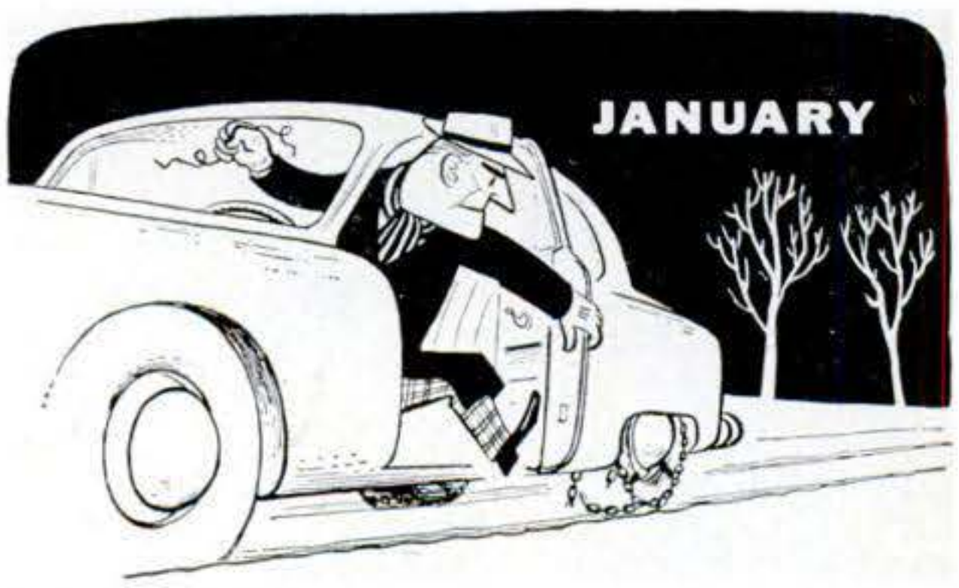
6 **IT SHOULD BE** nearly dark by now. Remove external screws and lift off trim rings. With high beam on, hang a coat over one headlight to align the other. There are usually five screws around the sealed-beam unit, three holding it in. Two others are for adjustment. First turn the one at left (as you face the lamp) to center the hot spot sidewise on the aiming point. Next, adjust the top screw to center it vertically. Drawing below shows correct centering on cross tapes. Cover this headlight to adjust other the same way. END





ALMANAC
FOR MOTORISTS

Pithy proverbs, provident counsel and omens and portents of interest to horseless-carriage operators.

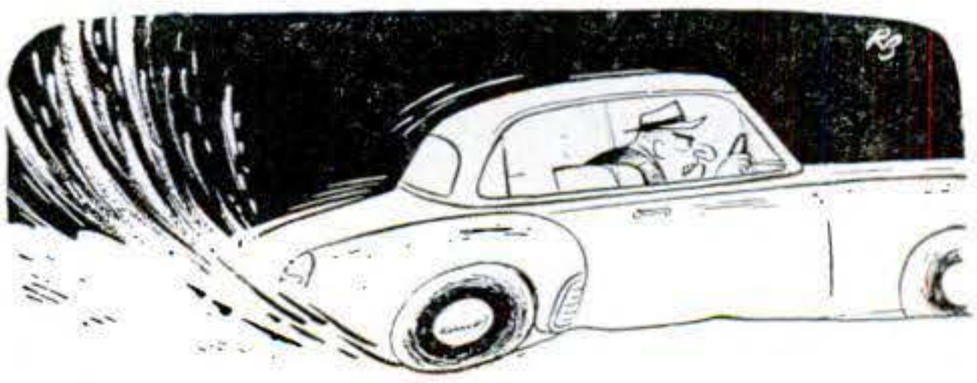


▶▶**A slapping cross link** on skid chains should be repaired or wired back immediately. Otherwise the flailing links will chip off the protective coating inside a fender and permit destructive future rusting.

▶▶**Minutes spent** in gently warming a cold engine are the mark of a man who respects his bearings and cylinder walls. He who races a cold engine is descended from horsewhippers.

▶▶**Recheck non-permanent antifreeze** if you do any trafficky driving on a warm winter's day. Some antifreezes lower the boiling point to a level where it is easy to lose protection without realizing it.

▶▶**On bare roads** with banked snow at the side, beware the unexpected icy patch that often occurs when the melt drains across the road and then freezes slick.



▶▶**Rhythmical rocking,** with the least possible wheel-spin, will save many a call for the tow truck. To prove it, watch an inept driver race his engine and promptly dig deep troughs that chock his rear wheels.

▶▶**How are those wiper blades** holding out? If they just smear up the wheel spray from the fellow up front, better replace them at your next gas stop. They're cheap.

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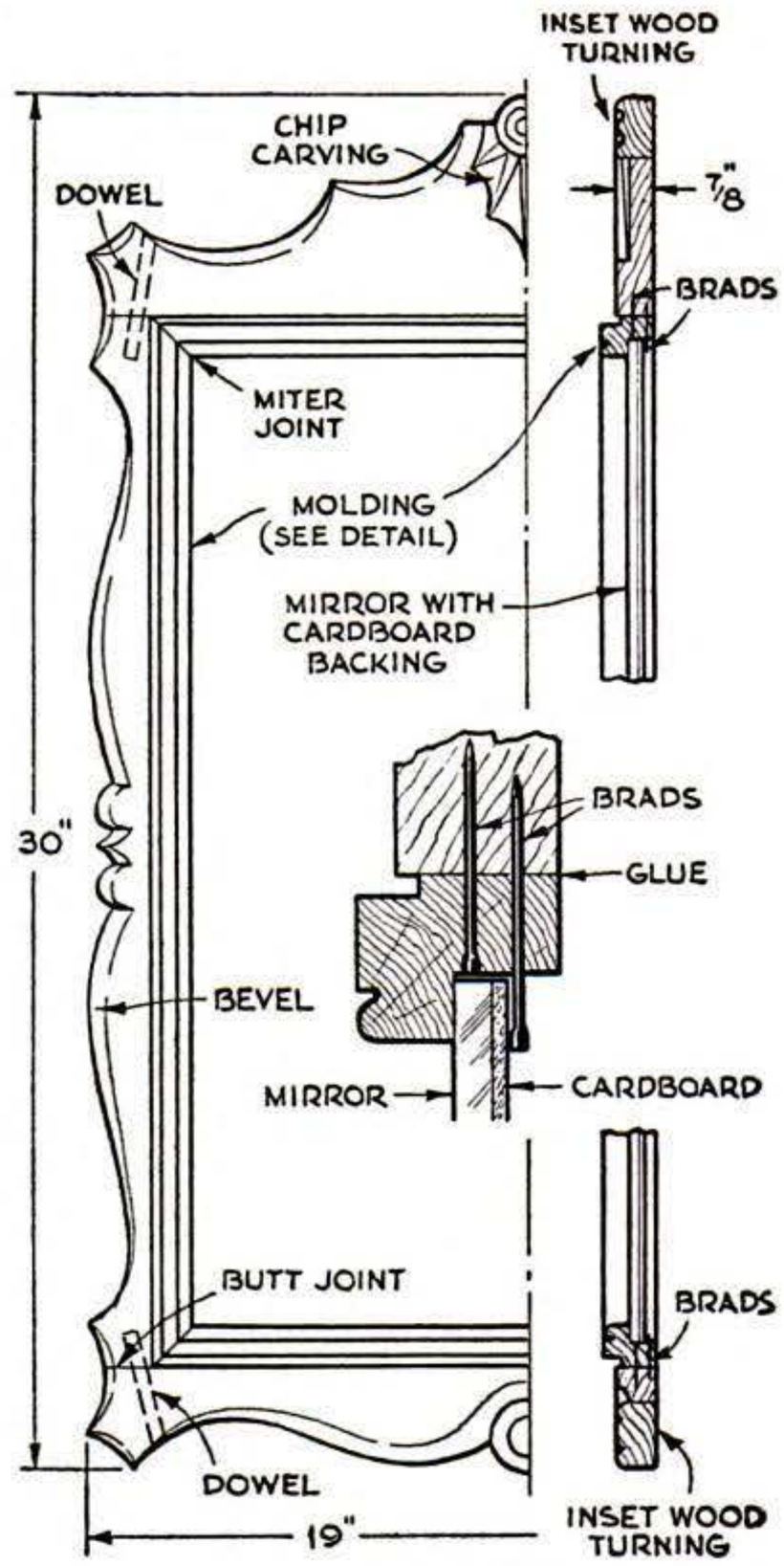

Frame a Mirror the Colonial Way

Don't scrap that old looking glass. Reset in an Early American frame, it will reflect good taste in any room.

HERE'S a simple way to transform a nondescript mirror into a handsome period reproduction. Scrollwork, spooling and chip carving do the trick, combined with a minimum of routine carpentry.

As shown in the drawings, the mirror frame is actually a frame within a frame. Mitered molding sections 1⅛″ thick, with ⅜″-by-½″ rabbeting at the back, margin the mirror and hold it in position. Outside this frame, a larger but shallower (⅞″) frame is formed of butt-joined pieces of white pine. For strength, the joints are doweled as well as glued.

Assemble the outer frame before sawing and beveling the scrollwork. Half-circle cutouts at the top and bottom receive the spool turnings, which are glued and nailed in place. Before attaching the top spool, chip-carve the fluting below it. Finally, glue and nail the inside frame members in place.

To finish, varnish the inside bead of the inner frame and dust it with bronze power while it is tacky. Brush the rest of the frame with Colonial-Pine Minwax, followed by two coats of furniture wax, rubbed well after each application. Insert the mirror and back it with heavy cardboard before bradding it in the rabbet.—*L. T. Cronk, Valhalla, N.Y.*

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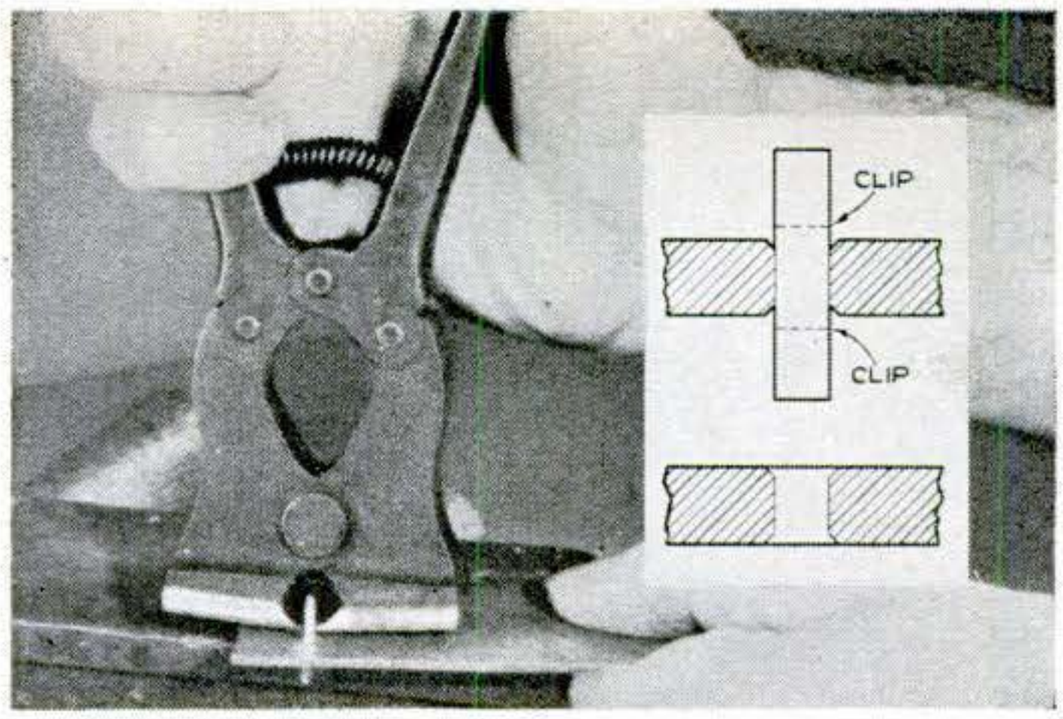
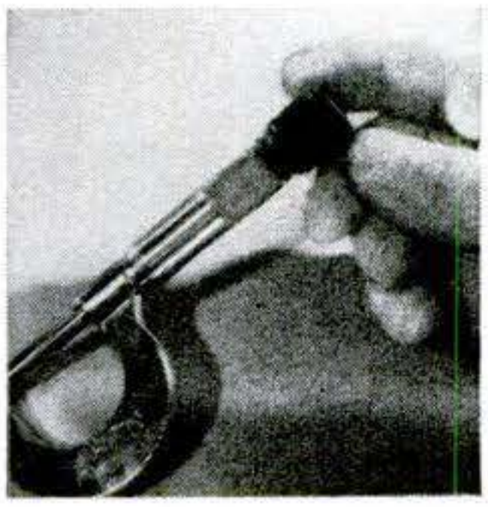


Plugging Holes in Soft Metals

ALL isn't lost when you drill a hole in the wrong place in aluminum, brass or other soft metal. Simply plug it with some more of the same.

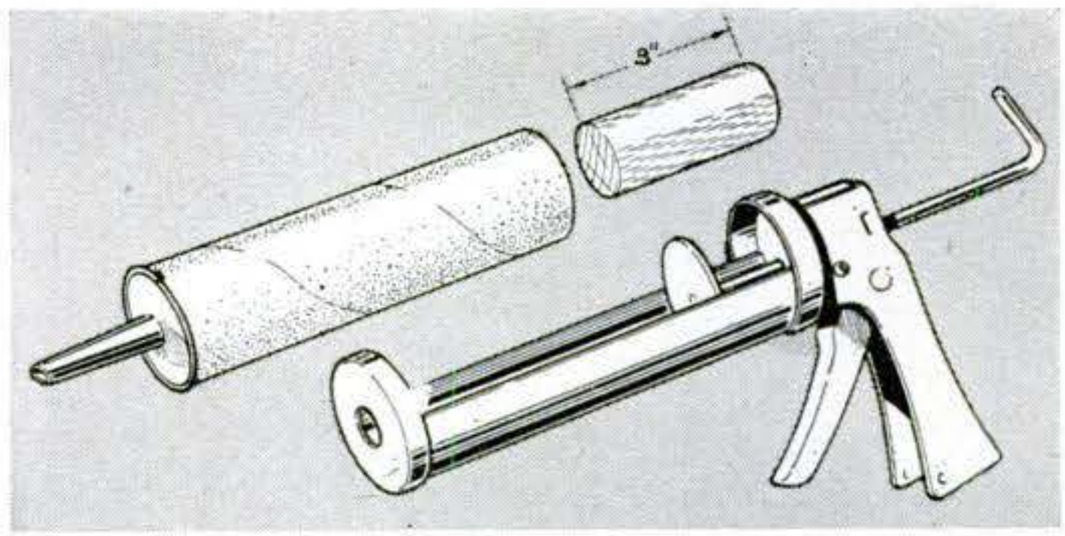
Countersink both sides of the hole slightly. Cut a slender wedge of the same stock, drive it in tightly, and clip it off on both sides. Then peen over the projecting stubs and file flush. Carefully done, the repair will be almost invisible.—*Walter E. Burton, Akron, Ohio.*

Improving a Low-Cost Mike



EXPENSIVE micrometers are equipped with a ratchet thimble that slips when the correct amount of pressure is applied. This gives uniform readings.

You can fit an inexpensive micrometer with a slip sleeve for this purpose. Push on a rubber nipple made for use on auto distributors.



How to Save Calking Compound

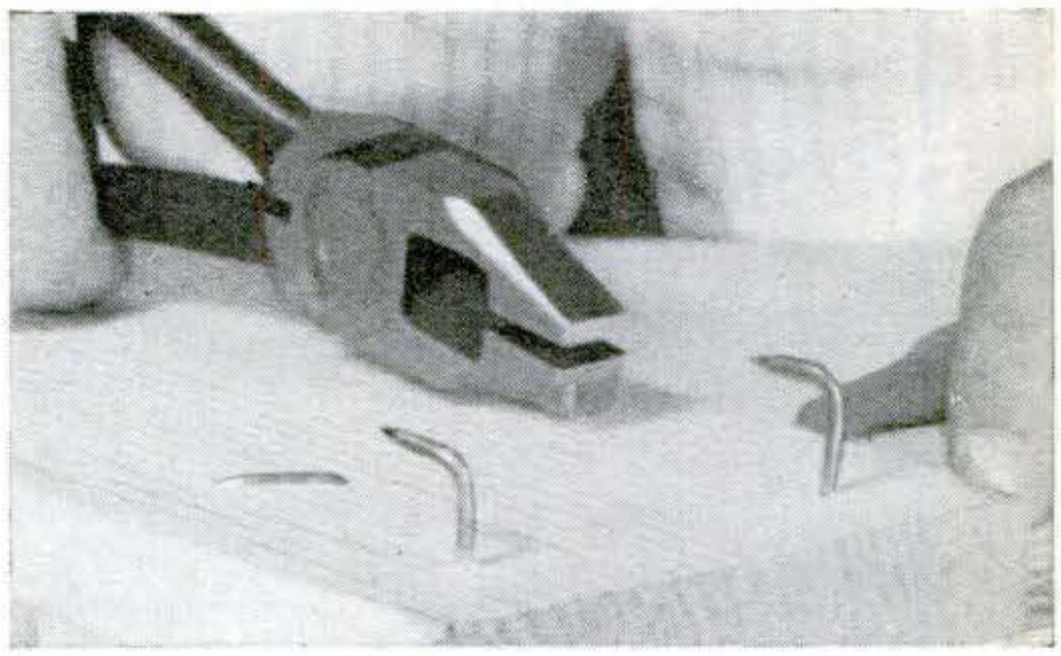
BY ADDING a 3" piece of broom handle to the inside of a spent calking tube, I have been able to get several extra feet of compound from each tube. There is a lot left after the plunger has gone its limit.— *Robert D. Gappinger, LaGrange, Ind.*

Divining Rod Finds Water Pipe

ALTHOUGH no water dowser, I used a divining rod recently to find my main water line, which entered tl.e house invisibly through the garage floor.

After some futile digging in the yard, I connected one secondary terminal of a doorbell transformer to the pipe inside the house. From the other terminal I ran a wire outside to a buzzer. The other side of the buzzer was wired to a metal rod.

I drove this rod into the ground repeatedly all along the garage wall. When it hit the pipe, the buzzer sounded off.—*J. J. Muldoon, Union City, N. J.*



How to Clinch a Nail

WHEN you must clinch a nail, first bend over the end, as shown above. Then hammer it down—and the point will be driven into the wood.—*Sam Grant, NYC.*

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Do you develop your own photographs? Here are some useful tips.

Darkroom

"Put your fingers in the soup as an instant test of whether your hypo is exhausted. Dip them first into the developer, rub them together to note the soapy feeling, and then dip them into the fixing bath. The soapy feeling will disappear if the hypo is still usable."

"The bite test is an easy way to find which is the emulsion side of matte-surfaced enlarging paper. Moisten the teeth slightly and bite the corner of the sheet to be used. The emulsion side only will cling to the tooth."

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Dora Says:

PHOTOS BY EUGENE M. HANSON

"A brushoff is good medicine for a film-changing bag. Light can't enter a good one, but dust can. Turn the bag inside out occasionally and clean it thoroughly."

"See that label? It means this tank is always used for developer. Any trace of hypo left in a tank can be ruinous if the same tank is used later for developer. Mark your trays, too."

"Stick to this rule when you're doing repair work on any equipment with many tiny parts:

"Spread a piece of cellulose tape, sticky side up, on your work table and then place the small parts on it. You can then instantly find any piece needed by holding up the tape; every tiny part will stay exactly as you put it down."

"Screws can't get loose in this camera. The bushings that adapt a foreign camera for use with an American tripod won't get lost if you put a drop of household cement into the socket before you screw in adapter bushing."

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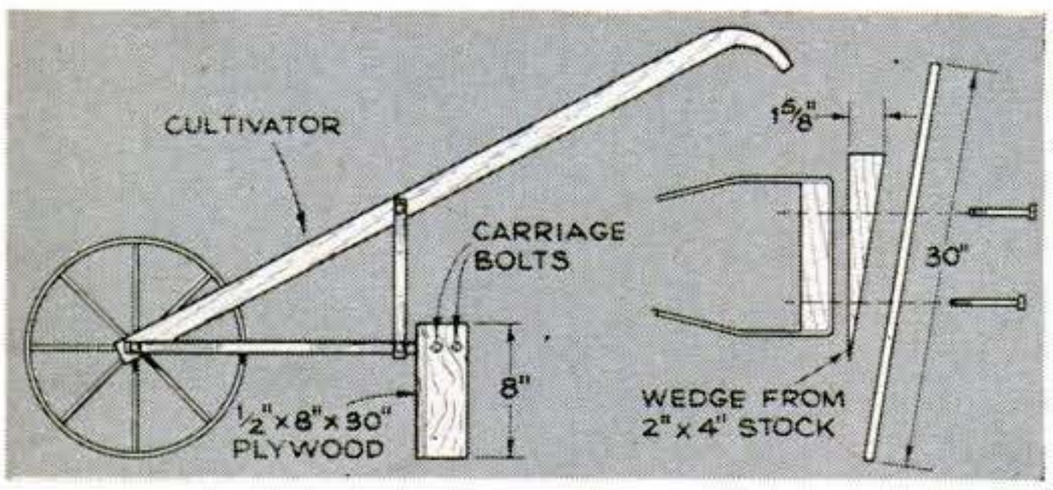
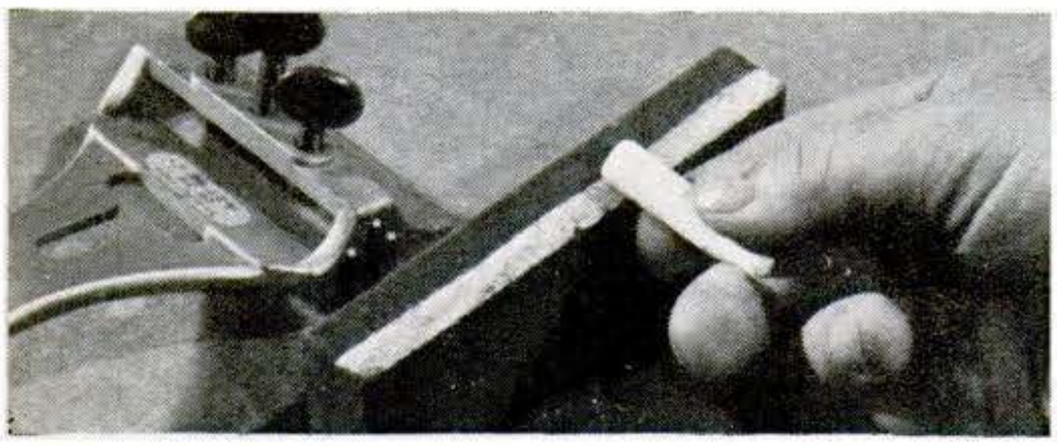


Cultivator Plow Clears Snow

THIS homemade plow works fine for light snow, clearing the sidewalk as fast as you can walk. I made it by bolting an 8"-by-30" piece of ½" plywood to the attachment bar of my push-type garden cultivator. A wedge cut from a 12" piece of two-by-four holds the vertical plywood blade at the proper angle for clearing the snow. As you push the blade along the sidewalk, it shoves the snow over to the right edge.—*Robert V. Stewart, Cleveland.*



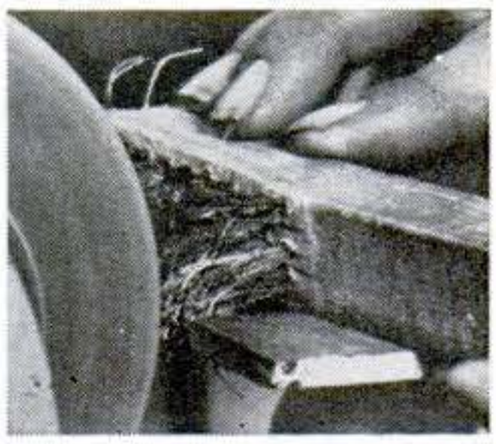
Chalk Identifies Sharpener

TO TELL at a glance which is the fine (finishing) side of an oilstone, mark the edges of this side with a piece of chalk. The chalk will remain despite handling and will not harm the stone.

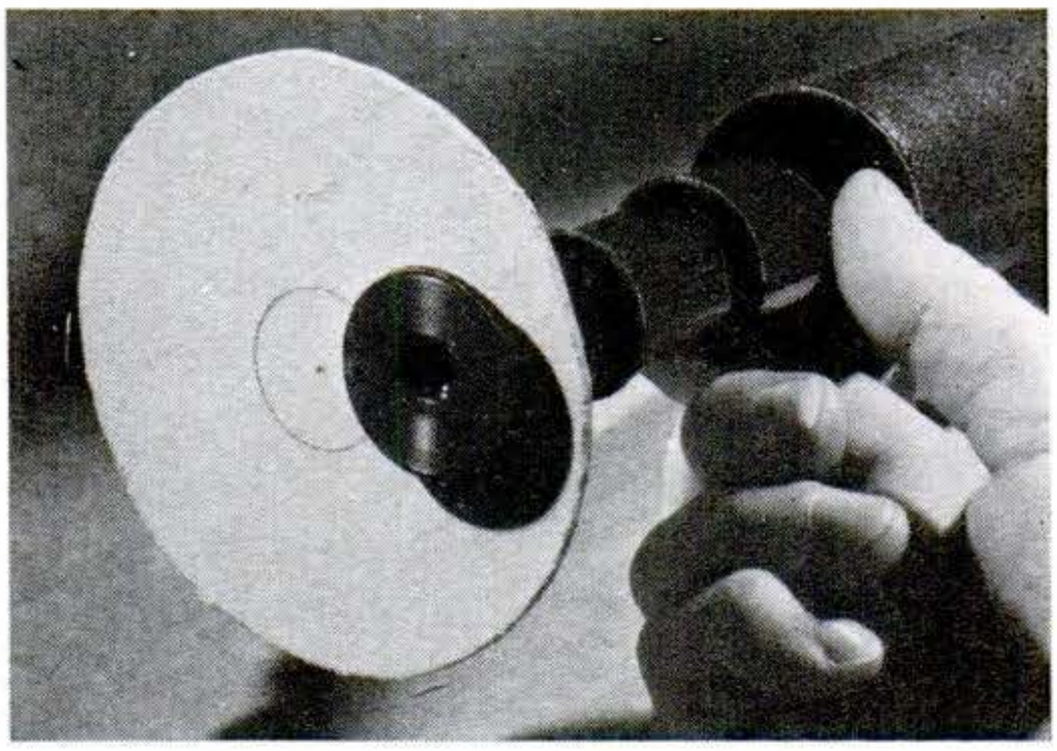
Ice-Skate Clogs Easily Made

You can put your ice skates on in the house and walk to the rink on these clogs. They are made of pieces of one-by-two stock. Straps hold the runners in grooves in the wood.—*Grover Brinkman, Okawville, Ill.*

Grinding Renews Steel Brush



AFTER heavy use a wire brush often becomes ineffective because the ends of the bristles are bent. Removing the bent portions by holding against a grinding wheel will put the brush back into service. —*Hugh Lineback, Stillwater, Okla.*



Telescope Baffle Rests Eye

SQUINTING through a telescope for long periods can become tiresome. It is better to relieve the strain of keeping one eye closed by providing a simple baffle to cut off vision from that eye. This one is a cardboard disk with a hole cut near one edge for a press fit around the smaller telescope tube after the eyepiece has been removed.—*Ken Murray, Colon, Mich.*

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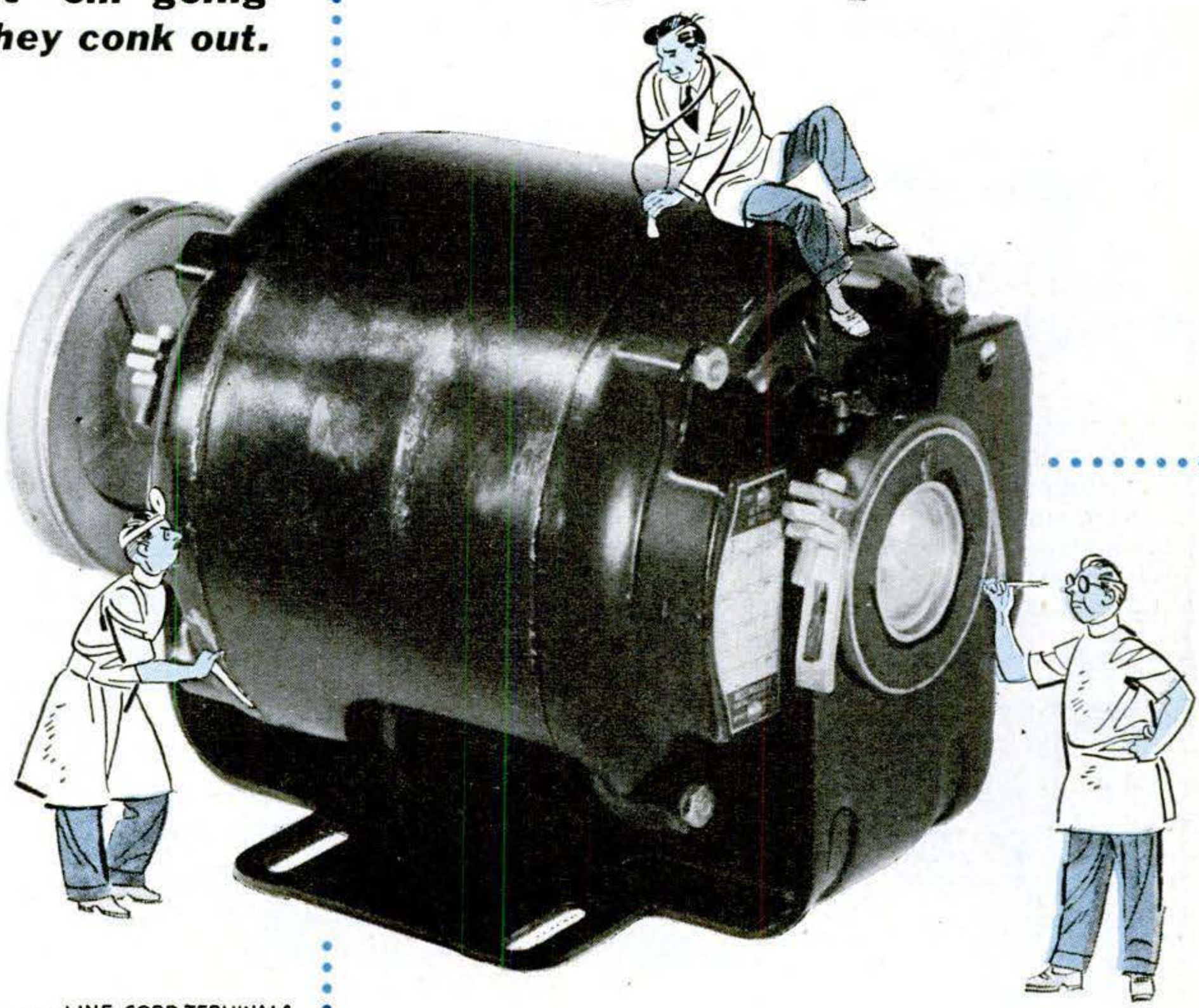
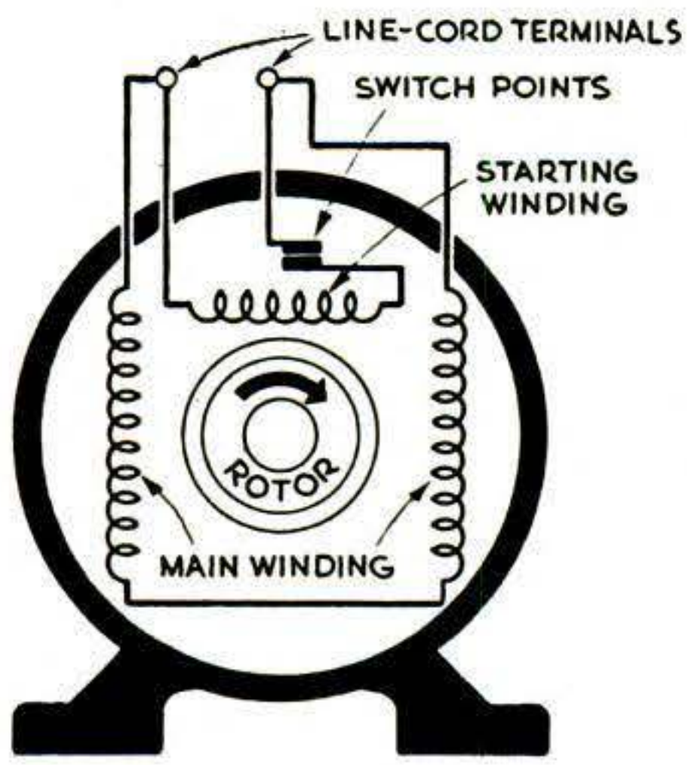
Sure Cures for Ailing Shop Motors

There's no mystery to trouble-shooting these shop helpers. Here's what you do to start 'em going when they conk out.





WIRING DIAGRAM for a split-phase motor. In actual practice both windings have a number of coils. The starting winding is cut out when the motor comes up to speed and centrifugal force opens the switch. To reverse such a motor, switch leads to either winding, but not both.

By J. W. Rocke Jr.

MIKE'S shop was closed, but he was in and opened the door for me. Inside, I set down the electric motor I had lugged along.

"It just sits and hums. Hate to bother you on a Saturday, but I can't run my lathe without it. Your wife said you wouldn't mind—"

Mike Evans grinned as if he meant it. "Think I've forgotten how you got my car started after that cloudburst? Glad to help."

I kicked the black brute on the floor. "Best motor in my shop, but it picks today to quit on me, just when I have a weekend to finish that HO locomotive. Think you can save it?"

"Let's see," said Mike. "Bring it here."

I toted the motor to his workbench and he plugged it in. But it didn't work any better for him than it

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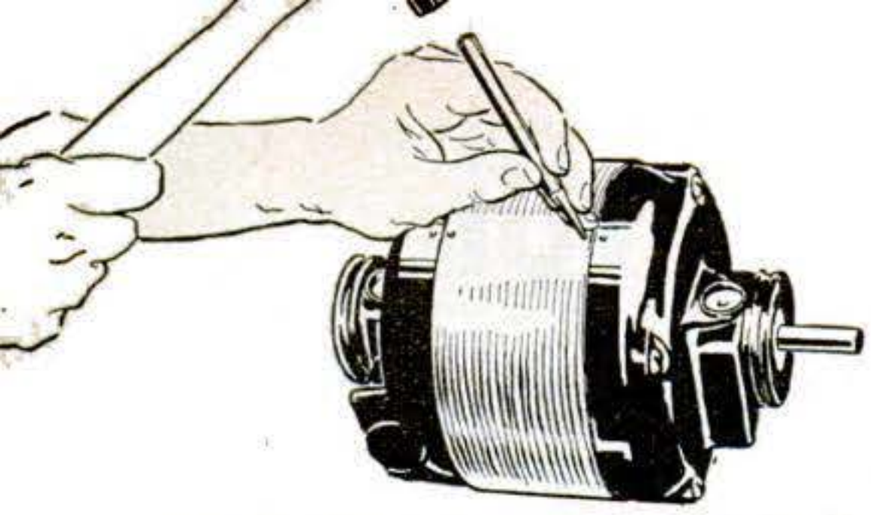
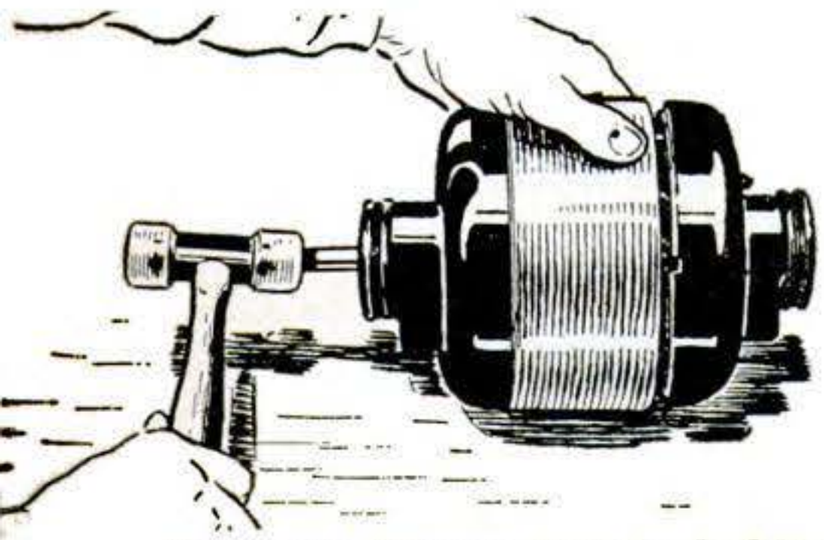
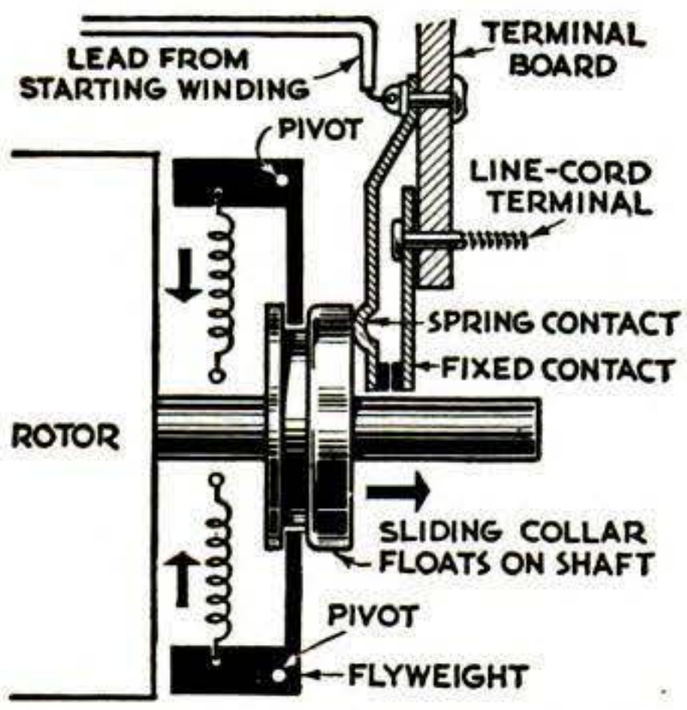


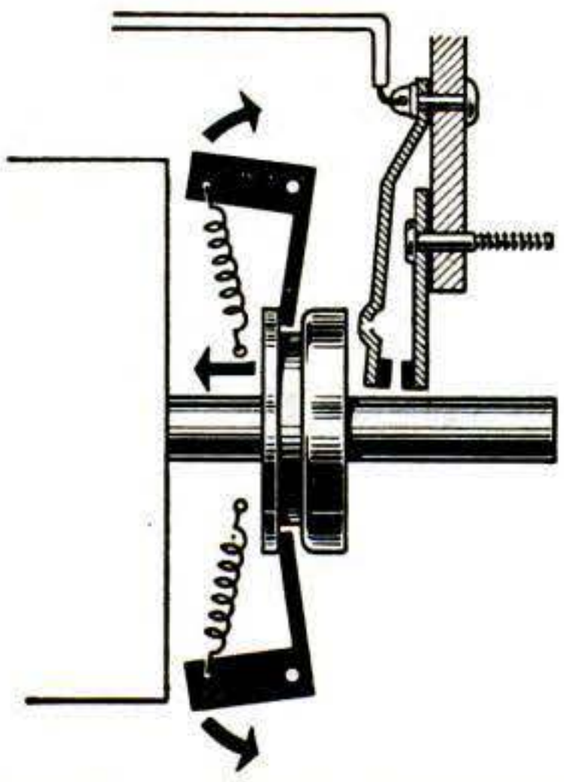
MARK STATOR FRAME and both end bells by making punch dimples close to each other. This will enable you to reassemble them in the same position.



REMOVE FRAME BOLTS holding the motor together. Use a lead or plastic hammer to tap motor shaft, as above, if end bell does not pull off easily.



CENTRIFUGAL SWITCH works like this. When the motor is at rest, flyweight springs hold the sliding collar against the spring contact, closing the starting circuit, as shown above. As the rotor reaches running speed, centrifugal force overcomes the springs; the weights fly outward, pulling the collar away and letting the contacts open, as below. There is no wear on this type of switch while the motor is running.



had for me. I began counting bucks toward a new one.

"See?" I said. "It hums, but doesn't turn—" I gaped, for Mike had given the pulley a twist and the motor was spinning contentedly.

"Hey! What'd you do? It wouldn't run for me!"

"Take it easy," Mike answered. "I believe you. We'll just let it run a bit before we start trouble-shooting it."

He laid a hand on the motor as it purred on.

"Sorry I bothered you," I said. "Maybe the plug wasn't in tight. I'll take it back."

Mike shook his head. "Not yet you won't. Something's wrong. But there's no sign of overheating, so we'll look for it in the starting circuit."

He pulled the plug, then punch-marked the motor housing in four places and unscrewed four nuts. Taking off one end of the motor, he frowned over a U-shaped piece of fiber encrusted with brass strips.

A Film of Oil and a Fat Spark

"Those contact points are dirty," he said. "And there's a thick film of oil on the whole works."

"Sometimes there's a fat spark inside the casing after I turn it on. But how could oil be the trouble?" I asked. "It ran a minute ago."

"If you don't mind a short course on AC motors, I'll tell you," Mike offered.

"I'm listening."

"Well, in this outside case you have what amounts to a circular electromagnet. Shoot alternating current through it, and you have an intermittent pull —on and off 120 times a second. Right?"

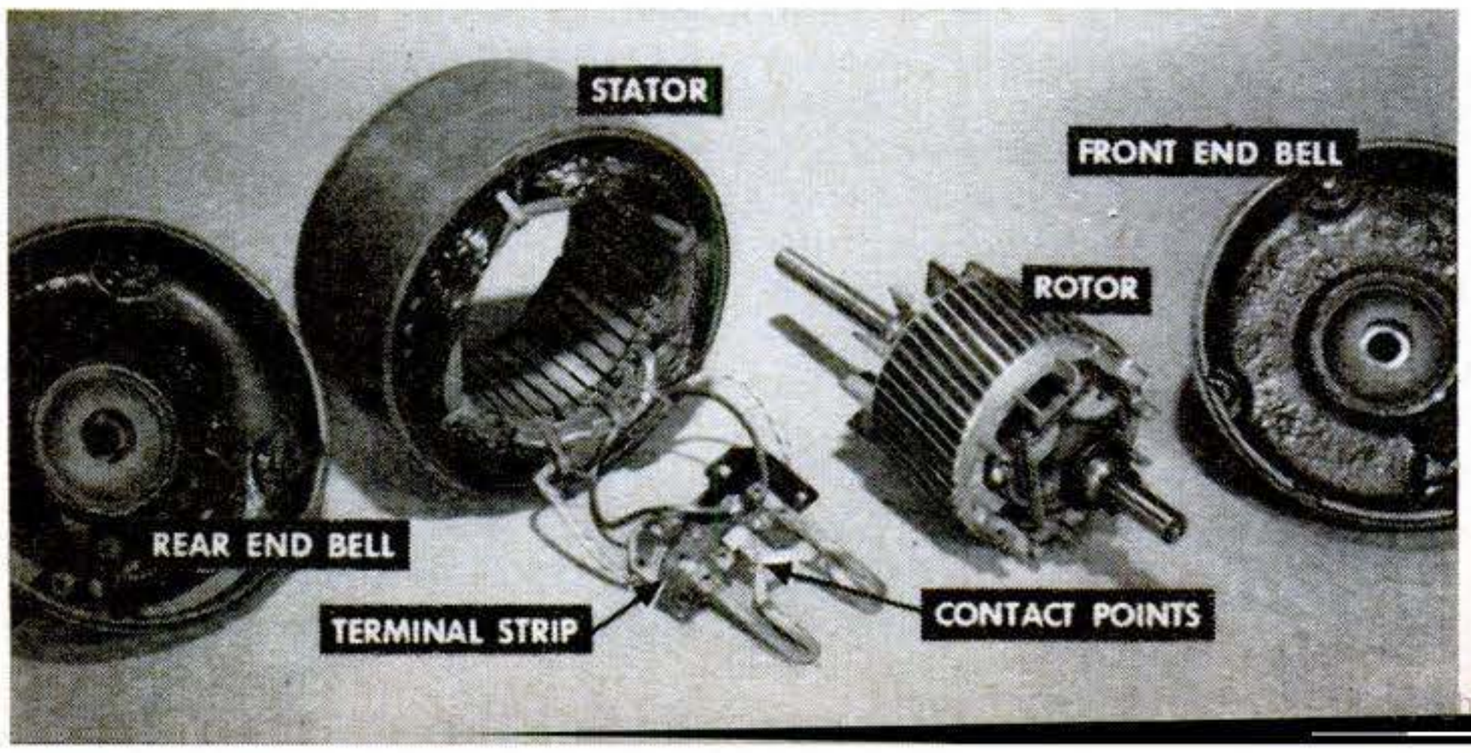
"Yes, but if it's just on and off, why should the shaft turn?"

"Good question. You need a rotary or twisting magnetic field for that. So the field magnet has a second set of coils." He pointed to them. "You see they're between the main windings. So their pull comes 90 degrees later, and you get an out-of-phase field that twists the rotor hard."

"Oh, I see—no I don't. If it's that simple, why the brass spinach inside the end cover?"

"Because you don't need both windings once the motor comes up to speed. You saw me start it by

MAIN PARTS of a typical split-phase motor look like this. Blow out loose dirt and wash parts with carbon tetrachloride.



twisting the pulley—it kept going on the running winding only. The light starting winding is in series with these contact points."

Centrifugal Force Cuts Off Juice

While he talked, Mike was cleaning the fiber plate with something that smelled like carbon tet.

"You see," he said, "this sliding collar on the rotor shaft is pressed against one flexible contact by springs when the shaft is stationary. Once it spins, centrifugal force makes these two weights fly outward, drawing the collar in, and opening the contacts."

"I'm with you," I said. "If the contacts are dirty, they won't close right, and you get no starting twist. But what about that sparking I saw?"

"Watch," said Mike. He disconnected a wire, then touched a test lead to each terminal, while pressing the contacts together.

"See that? The bulb doesn't light. These points are so burned they won't pass current. What burned them was the arcing you saw—every time the motor was started, they burned more."

"But why? Other motors in my shop have run longer. And this is the best one I've got."

Mike grinned at me. "That's why, I guess. You killed this one with kindness. Probably oiled it every time you used your lathe."

"Sure. I don't want it to run dry."

Too Much of a Good Thing

Mike shook his head. "Over-oiling makes trouble. Extra oil is thrown on the contacts, making a high resistance that causes overheating. On the break, you get arcing—and more heat."

"After this," I promised, "I'll oil the motor once a month—no more."

"Once every *three* months is plenty," said Mike as a young fellow came in from the back room. "And only a drop or two at a time. You know Bud Edwards? He helps me Saturdays."

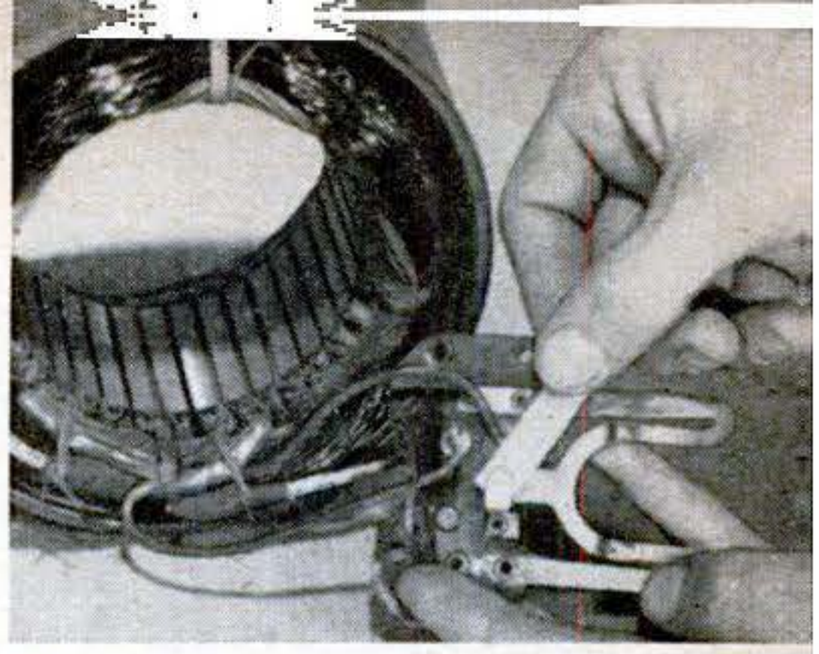
Bud nodded to me, but he evidently had more than courtesy on his mind. "Mr. Evans, will you take a look at the motor I'm working on? The starting contacts were practically welded together. I cleaned them, and the windings check out fine—but the motor still won't start."

Mike didn't budge, but he looked thoughtful. "See anything strange in that, Bud?"

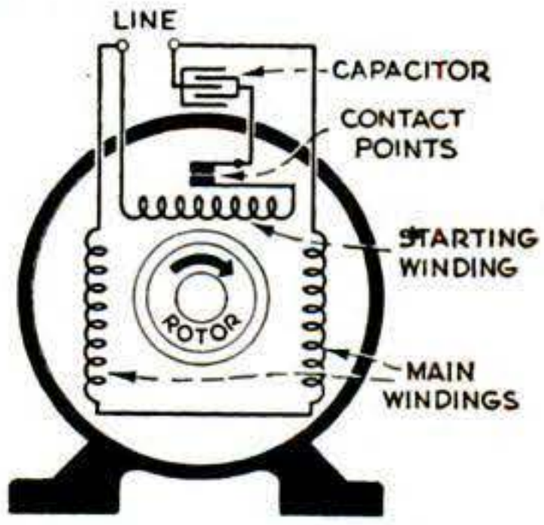
"Strange? No, sir."

"Mm—seems odd to me that the starting windings aren't burned out, if the contacts were stuck together."

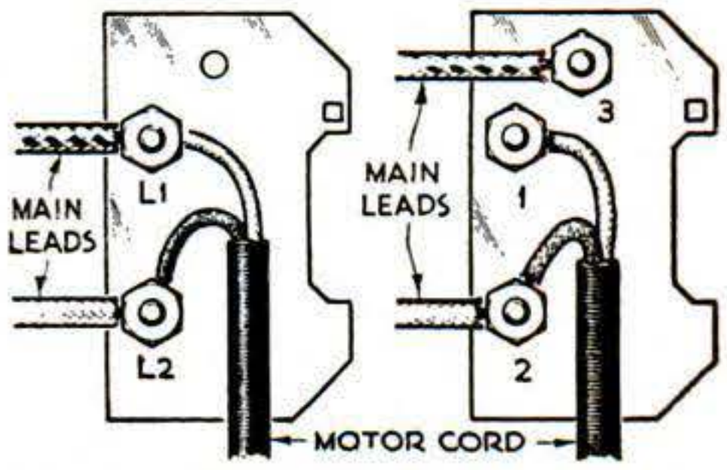
Bud leaped as if stung. "Gosh, yes! With juice going through all the time, they should be burned out



CLEAN STARTING SWITCH carefully with a folded strip of sandpaper like this. Then wash contacts and terminal strip in carbon tet to remove oil and grease. Be careful not to bend the contacts askew or alter the spring tension.



CAPACITOR-START MOTORS, which have more starting torque than split-phase types while drawing less current, have a heavy-duty condenser or capacitor in series with the starting winding. By momentarily storing current, it provides a starting boost. It also absorbs the surge that occurs as the points open, and so reduces arcing. Heavy-duty capacitor motors may have such a condenser in series with the main winding as well as the starting coils.



FOUR WIRES come to the terminal board from inside the motor. If only two are visible, the others are connected on the back of the board. Reversing the two main leads (above left) will change motor rotation. If in doubt, disconnect two winding leads and use a test lamp to find two ends of one winding. Motors with a thermal-overload switch may have a terminal block as at right. Interchange leads at terminals 2 and 3.

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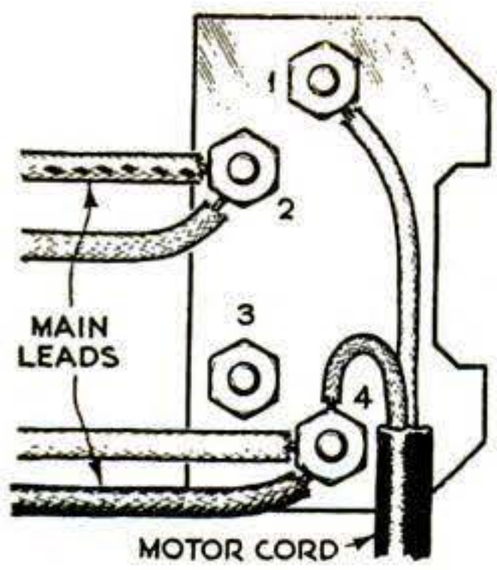
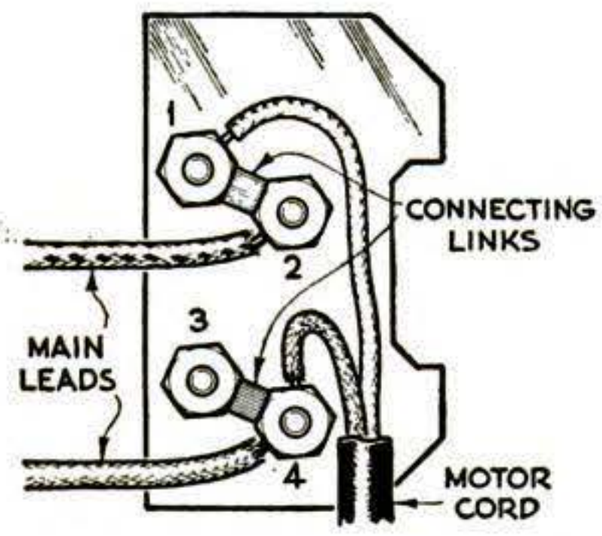
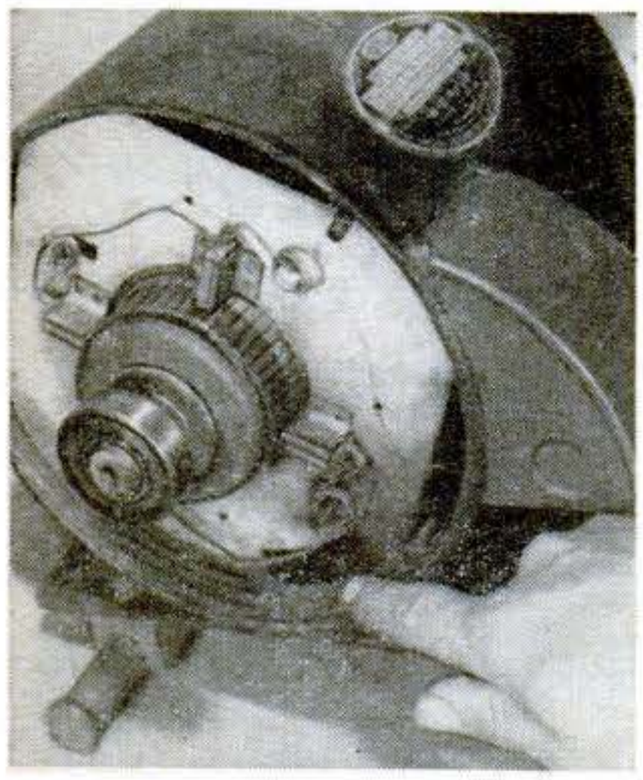


TYPICAL TERMINAL BOARDS for motors that can be connected for either 115 or 230 volts are shown here. To reverse the one above, the main leads must be positively identified. A mistake may damage windings. If in doubt, write the manufacturer. To reverse a motor having strap connectors (below), interchange two main motor leads. Hookups shown are for 115-volt operation.





REPULSION-INDUCTION motors have a commutator and brushes, here visible with end bell removed. The brushes ride the commutator constantly. To reverse such a motor, shift the brush ring according to marks on the end bell. Repulsion-start motors are similar, but the brushes are automatically lifted off the commutator at normal running speed. If brushes are not properly set, starting torque may be low.

unless—I get it! It's a capacitor motor, and the capacitor must be open and not passing current, or those windings would be gone. I'll check the capacitor."

He bounded off. Mike dressed the contact points with a fine file and washed the works again.

Test Lamp Spots Trouble

"Look, Fred, I'll show you how to check motor windings in case you ever want to. First thing is to disconnect all the leads on the terminal strip, because you want to test each winding separately. It's smart to identify each wire and terminal with marked bits of tape as you go."

Having removed four wires from the terminal nuts, he picked up the test leads he had used before.

"This is a simple test circuit you can rig in five minutes. Touch one of the test leads to each end of a good winding, and the bulb lights."

He touched the leads to the two heavier wires, and sure enough the bulb glowed. It glowed again across the two lighter wires. Then he touched one end of each winding and nothing happened.

"Hey! Is that bad?" I asked.

"No, that's good. If the bulb lit, it would indicate a short between the two windings."

Mike made one more test. Holding one lead on the bare metal of the stator frame, he touched the other to each winding. No glow.

"Bad?" I asked anxiously.

"No, good. Any glow now would indicate a ground —some of the winding in contact with the frame."

I. shifted my mental gears. "So what? The thing would still run, wouldn't it?"

"Right. But the motor is bolted to the lathe, and you touch the controls, and your cellar floor is concrete, so it could give you a nice, juicy jolt. That's why shop motors ought to be grounded. Just run a wire from a clean spot under a motor bolt to a water or steam pipe, and you'll be safe."

"Thanks. I'll do that—"

"Mr. Evans!" It was Bud back again, a bit wild-eyed this time. "I checked that capacitor, and it was open. So I put in a new one, but it still won't start!"

The Case of the Missing Shim

Mike glanced at me. "Mind if I take out a minute to look? Yours will be okay when I put it together."

"I'd like to look, too," I said. "Bud's job is getting to be as exciting as a whodunit."

We went to Bud's bench. The motor on it had a round black case at one end.

"That's the capacitor," Mike explained. "The old one probably broke down gradually, causing severe

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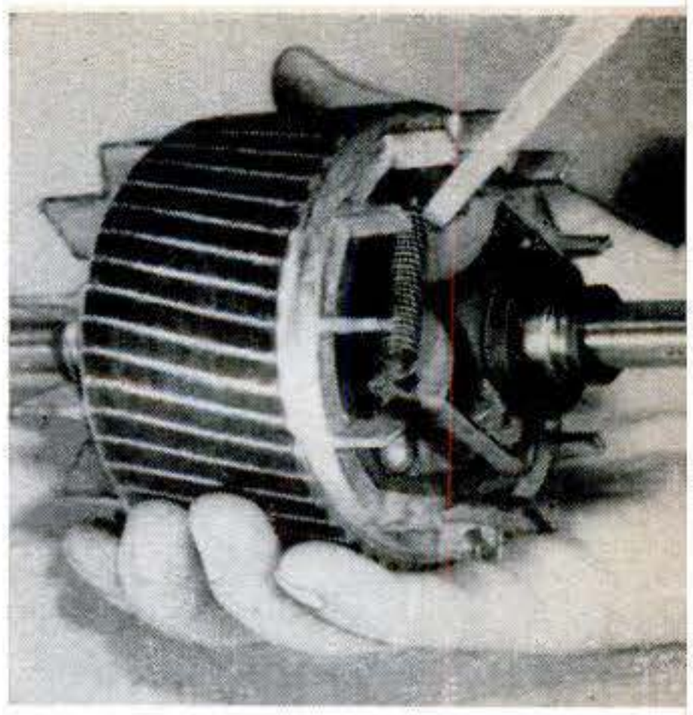
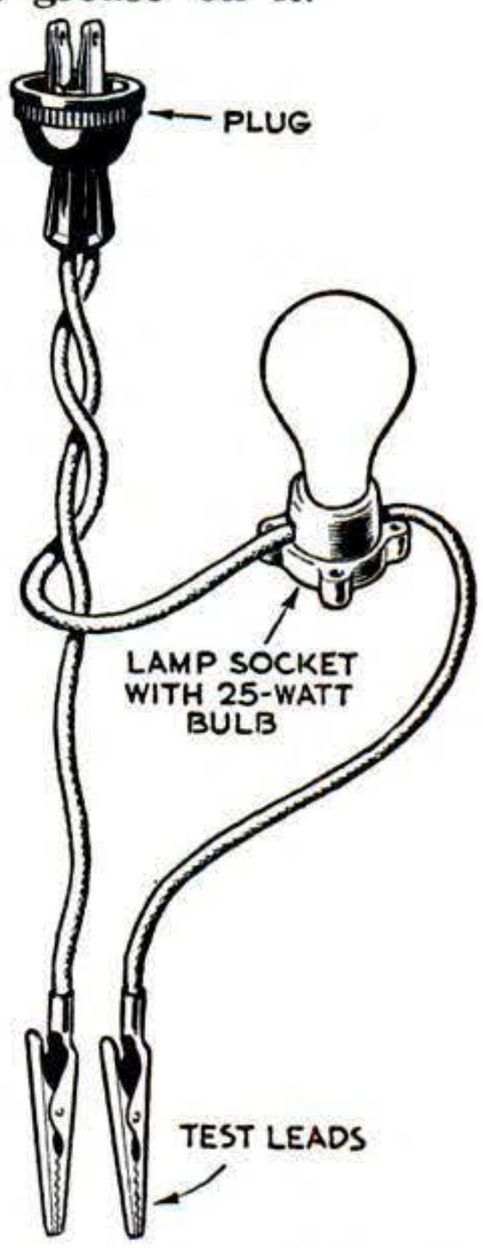
TROUBLE-SHOOTING CHART

SYMPTOMS	POSSIBLE CAUSES	REMEDIES
No hum or action of any kind	Blown fuse, faulty switch, faulty line cord, broken internal connections Open capacitor in capacitor start and run motor Motor burned out	Check each and repair as required. Check capacitor, and replace. Check windings for charring. Rewind.
Motor hums, but will not start	Broken leads in starting winding circuit Starting-contact points dirty Starting-contact points not making contact Excessive end play in rotor shaft holding contact points open Starting capacitor open	Check for break, and repair. Test and clean. Rework as required to make contact when motor is not running. Shim rotor shaft with fiber washers to reduce end play to 1/64". Check and replace. (Emergency operation possible by wiring capacitor leads together, and operating motor as straight split-phase.)
Motor heats excessively	Motor overloaded Ventilation has failed Internal grounds or short circuits in windings Rotor dragging on stator due to worn bearings Bearing tight due to lack of lubrication or improper alignment of end bells.	Operate without load and see if heating continues. Clean vents and blow out motor housing with air blast. Check windings for shorts and grounds. Inspect rotor, check bearings, and replace as required. Treat as required.
Excessive vibration	Pulley out of balance or loose Worn bearings Rotor out of balance Internal shorts in running windings Motor and load misaligned	Try another, or tighten. Replace bearings. Have repair shop balance rotor. Have checked at a repair shop. Correct alignment.
Motor sluggish and slow to start even without a load	Low line voltage Starting winding shorted or grounded internally Windings of starting winding shorted to each other Capacitor leaking internally, or too small	Check line voltage; check line for overload. Check starting winding for short to main winding and stator. Repair or rewind. Requires checking by a motor-repair shop; rewinding necessary. Have repair shop check capacitor.

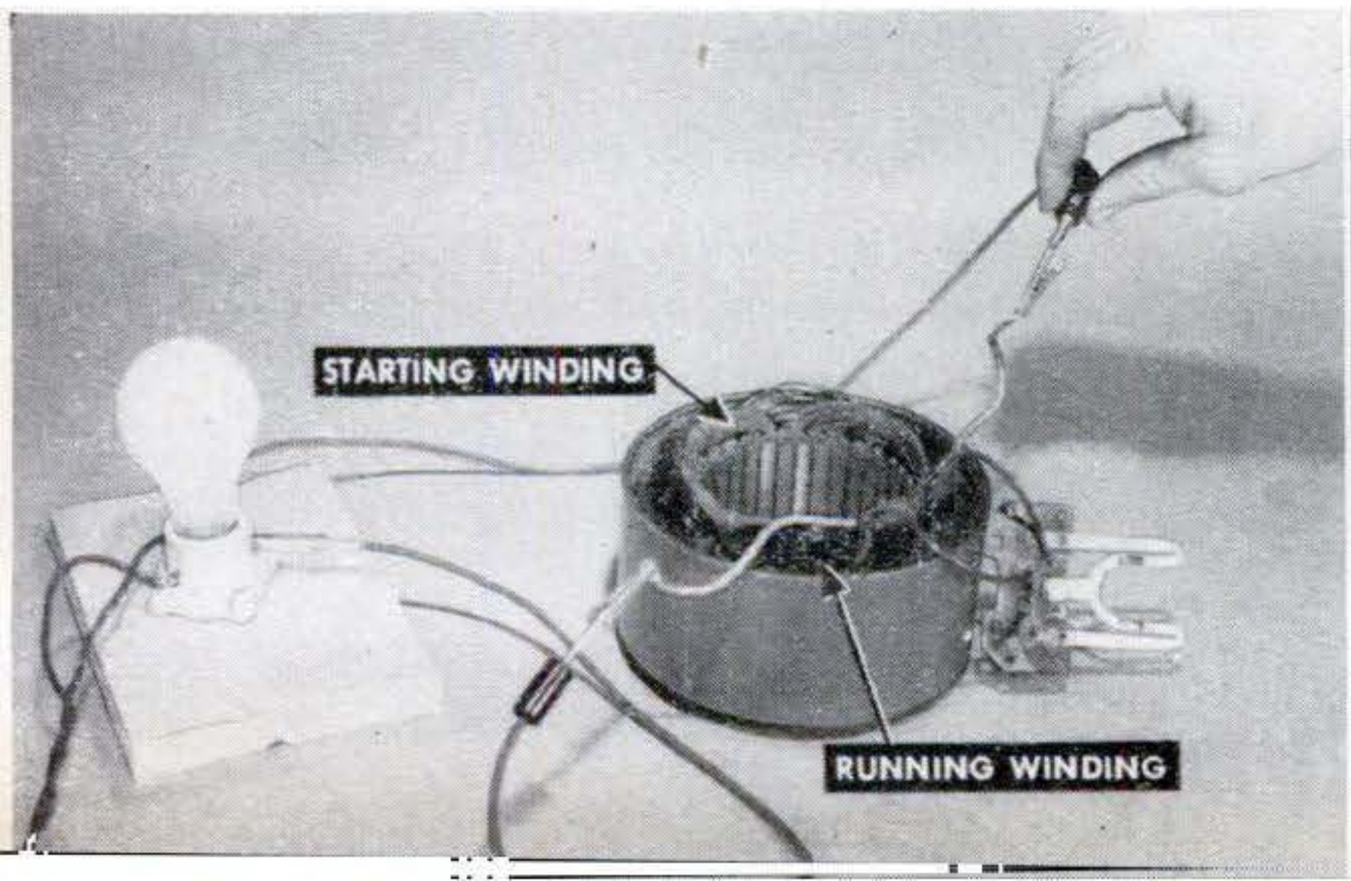


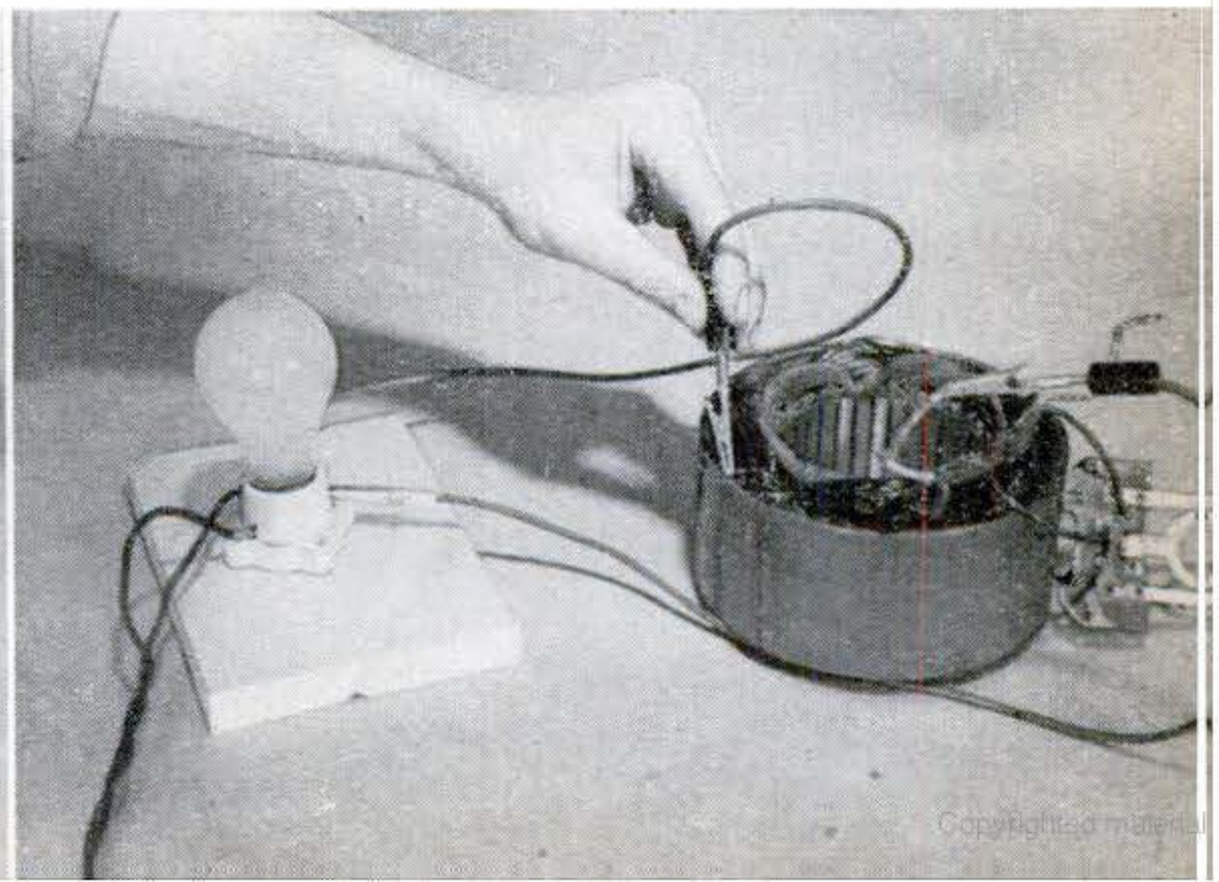
CHECK SPRING ACTION on the flyweight assembly. Weak or broken springs may not press the sliding collar firmly against starting contacts. Lubricate collar only with a grease stick. Never use oil or light grease on it.



A test lamp makes it easy to find breaks

TO TEST WINDINGS, remove all leads from the terminal strip. Running or main winding has huskier coils than starting winding. Test lamp is wired as at right above. Use insulated test leads or clips to avoid shock. Touch one to each end of a winding (below). If lamp does not light, look for break in connection of leads to winding. If break is internal and can be located, repair by splicing and insulate well. If break cannot be found, have motor rewound. Check for grounds between both the windings and frame, too. If lamp lights with one clip on bare metal and the other touching any winding lead, locate short and insulate at that point. Motor may run with a ground, but it is a shock hazard. Also check for shorts between the windings by touching test clips to one lead of each. Make sure all leads are off terminal strip for this test. If lamp lights, try to find where windings make contact.





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arcing across the contacts, which eventually welded them together."

Thoughtfully he looked at the motor, twisting the shaft as he did so. Suddenly he stopped turning it to push it endwise instead. His sharp eyes roved the bench top.

"What's this, Bud?" he asked, picking up a fairly thick fiber washer.

Bud's ears went red. "I—gosh, that's a rotor spacing shim I forgot to put back. I'll take the motor apart and put it back right away."

"Do that, and then call me," said Mike.

He led me back to his own bench. I itched to ask him why he didn't stay to check the inside of the motor while Bud had it open, but kept quiet. Mike reconnected the leads to the terminal strip of my own motor and reassembled it with punch marks on the housing together. Making sure the shaft spun freely after the frame bolts were tightened, he plugged it in. It turned, clicked gently, and kept running.

"Good as new," said Mike. "And paid for since that rainy day last month. Don't argue."

I didn't argue, for Bud stuck his head in sheepishly just then. We went back to the other workbench with him.

"I put the shim in, Mr. Evans. Now will you see what's wrong?"

"I don't think there's anything wrong now, Bud. You fixed it." As he spoke, Mike plugged the motor cord in. The motor promptly went into action.

"But—but it didn't work before!"

"Because the shim was missing, Bud."

I was as puzzled as Bud looked. "I don't get it, Mike. What does the shim do except prevent shaft end play?"

"Nothing. But if this shaft has too much end play, the collar doesn't bear against the starting contacts hard enough to close them. No juice gets to the starting windings, and the motor doesn't start. Bud fixed it when he put the shim back." END

HINT TO AN UNHANDY HANDY MAN

I like to study patents;
The wording seems so funny.
But that, I've learned, is why some bring
A plurality of money.

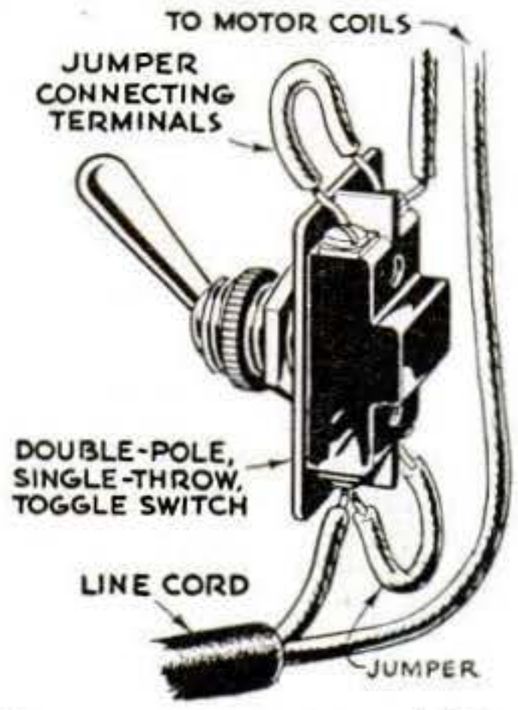
—Hugh Lineback

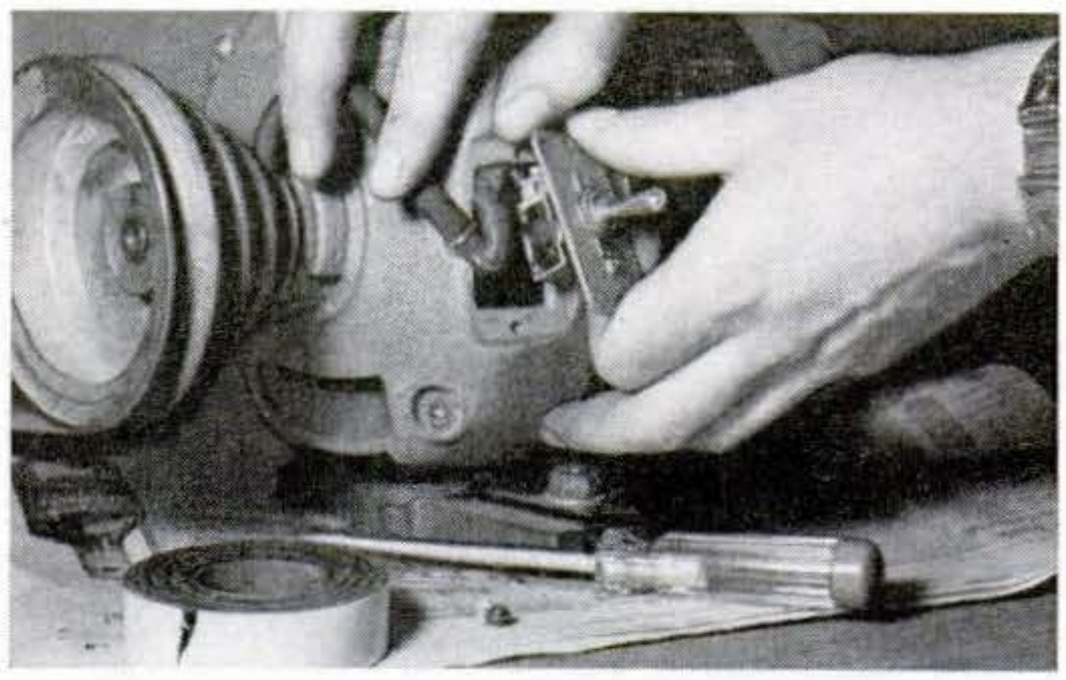
Flush Screws in Sheet Metal

Screws can be set flush in sheet metal by sinking deep dimples in the stock. With a wood block beneath, place a bearing ball or a small ball-peen hammer over the screw hole. Hit hard enough to form a suitable depression for the screw head.—*Henry Josephs, Gardenville, Pa.*

Doubling Up Contacts of On-Off Switch Lengthens Its Life

A vulnerable part of all shop motors is the on-off switch. Heavy current, sawdust and dirt give it a hard time. If a motor acts as though it isn't getting current, check the toggle switch.





In replacing the switch, buy one of adequate rating (10 amp. for motors up to ½ hp.; 15 amp. for larger motors). Never use the light-duty type intended for lamps and light fixtures.

A good way to lengthen switch life is to buy a double-pole type and use both sets of contact points as shown above. Be sure to add both the jumpers shown in the drawing. With the load so divided, the contacts will last longer. If the switch-plate hole is too small, file it out.

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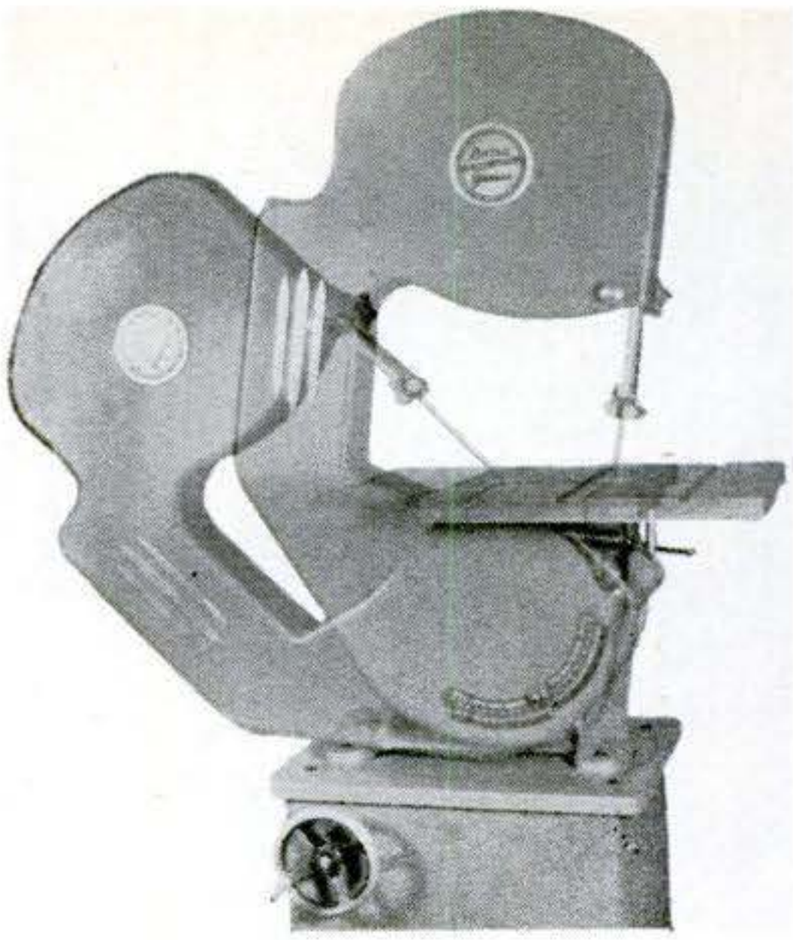
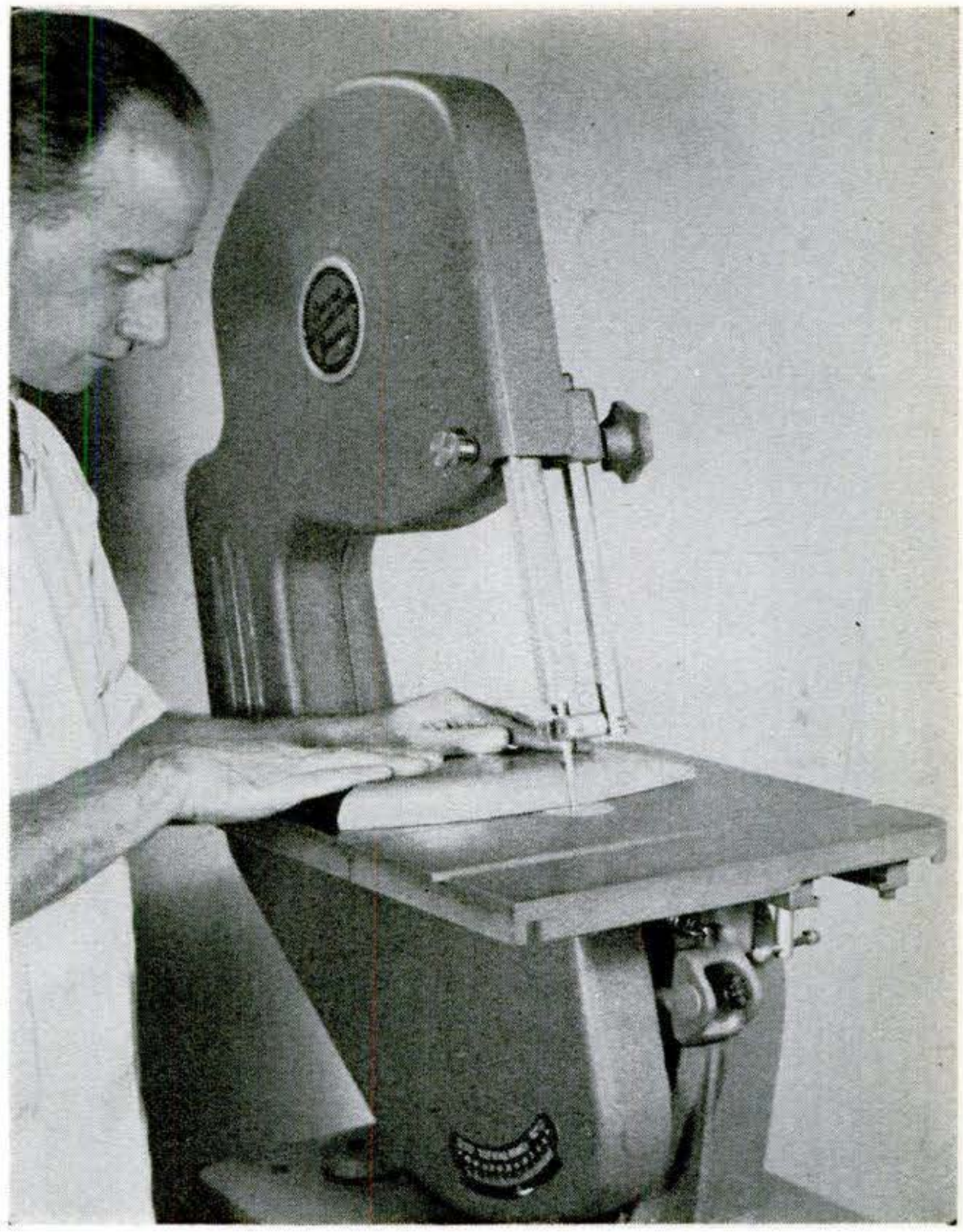
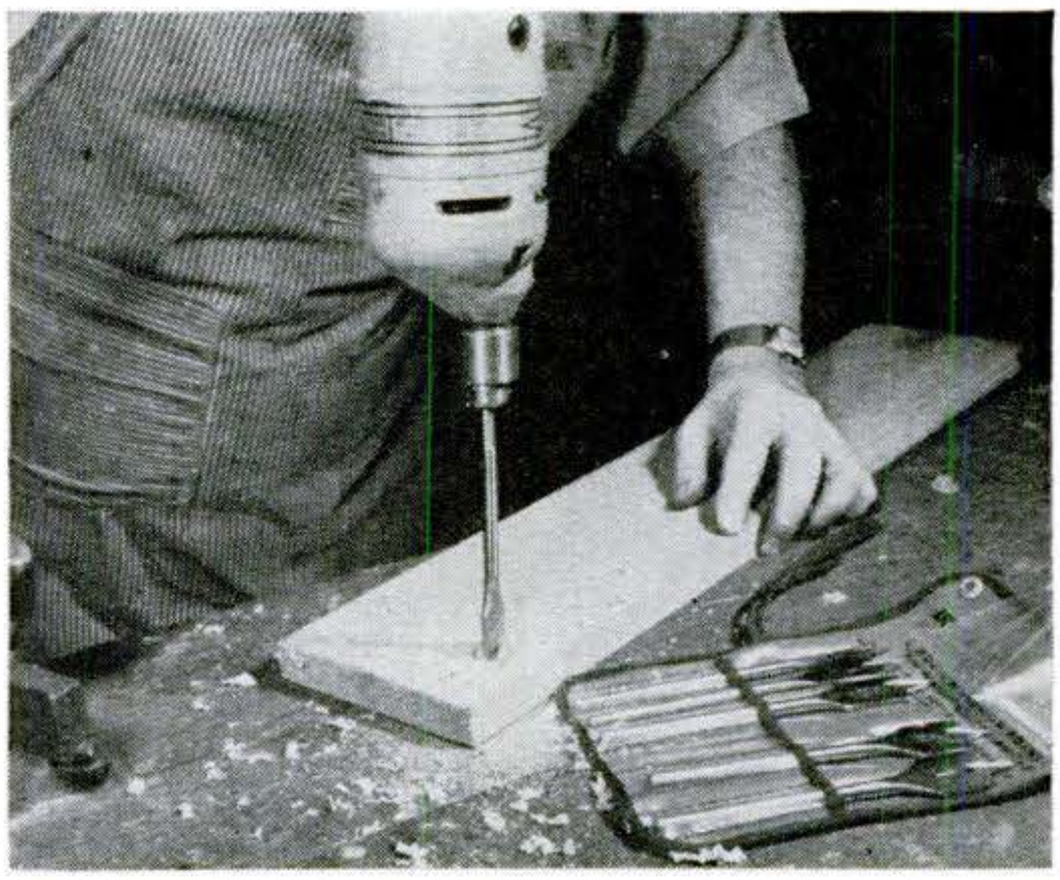


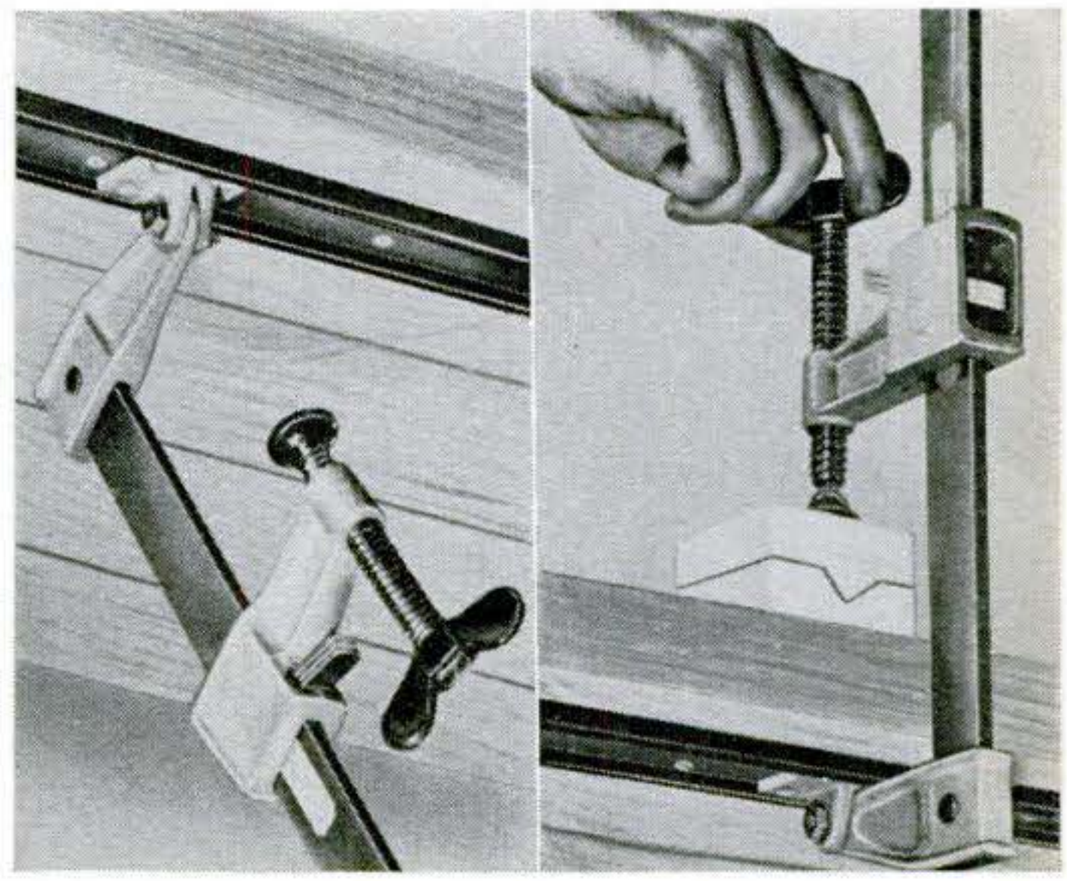
1. Bandsaw Cuts Angles. Want to shape a boat hull or some other irregularly contoured object? This tilting bandsaw will not only cut any angle you want, but can actually be moved while in operation to let you vary the angle of cut as you go along. It swings up to 46° backward and 7° forward. The counterweighted base permits easy tilting at a touch, while the table rides in and out on a track that keeps it level and allows it to follow the position of the blade automatically. The saw will cut stock up to 9⅛″ thick.



New Tools



2. Drill Bits Cut Faster. Hollow-ground points on these new spade-type drill bits speed the boring of wood, plaster, and plastics. The drills have ¼″ shanks and are available in 11 sizes from ⅜″ diameter to 1″. Hang-up holes in the heads of the bits make it easy to arrange them on hooks on a tool board.



3. Clamp Swings Out of Way. With its lower end mounted under a workbench, this bar clamp is always ready to use. When the job is done, the pivoted clamp swings out of the way under the bench. The base plate can be screwed underneath or mounted in a track so the clamp can be slid sideways to any desired point along the bench.

Please turn the page for more new tools

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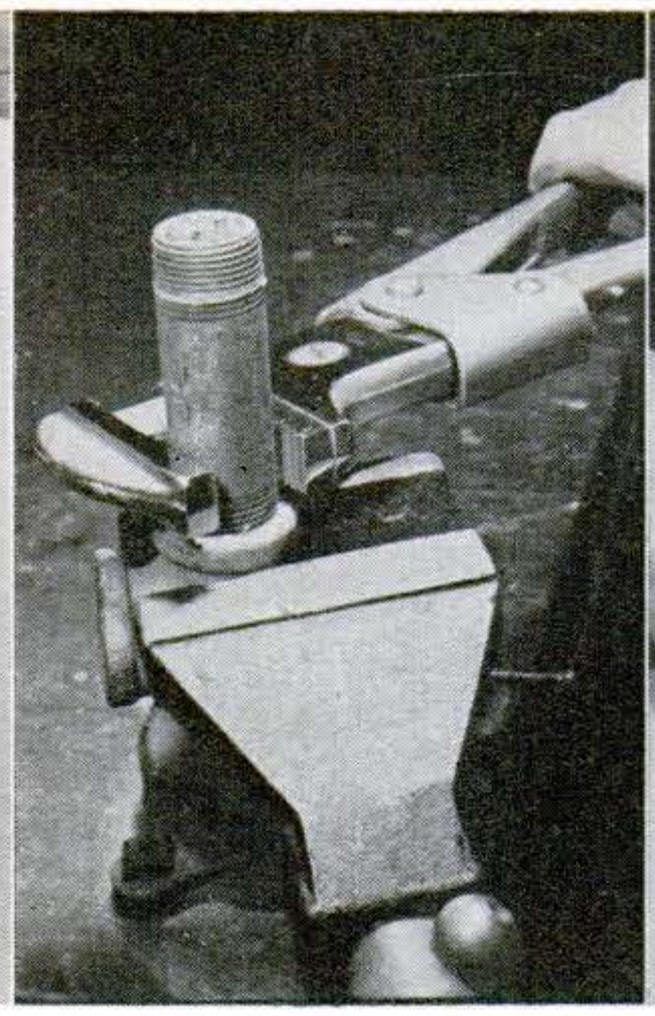
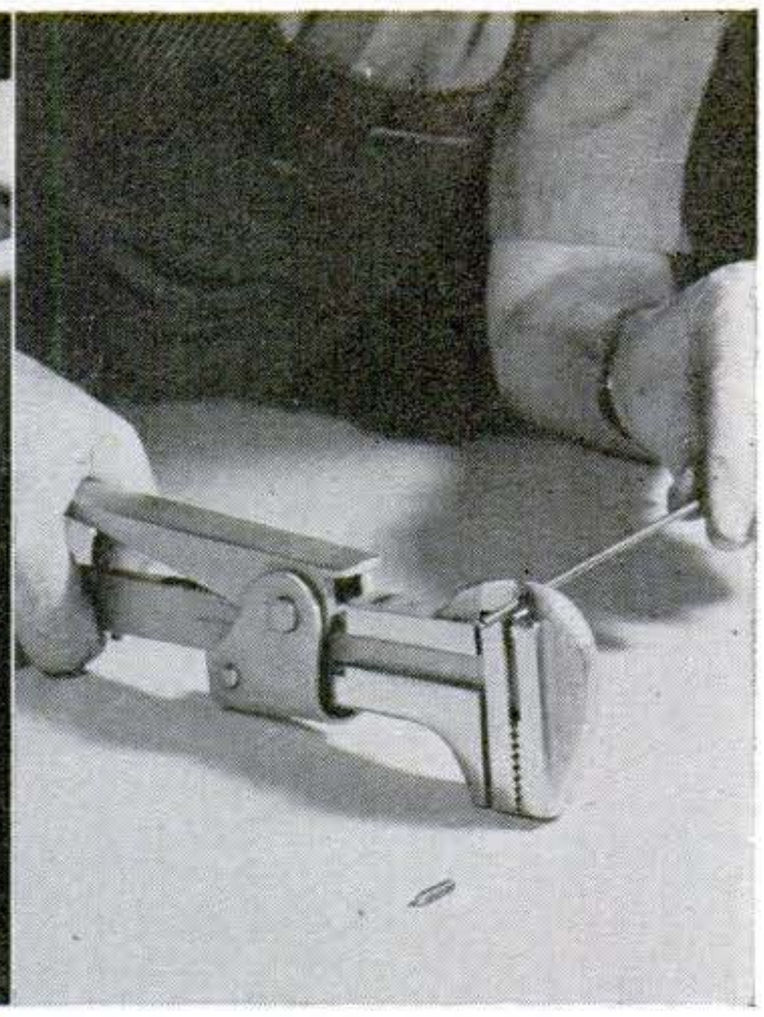
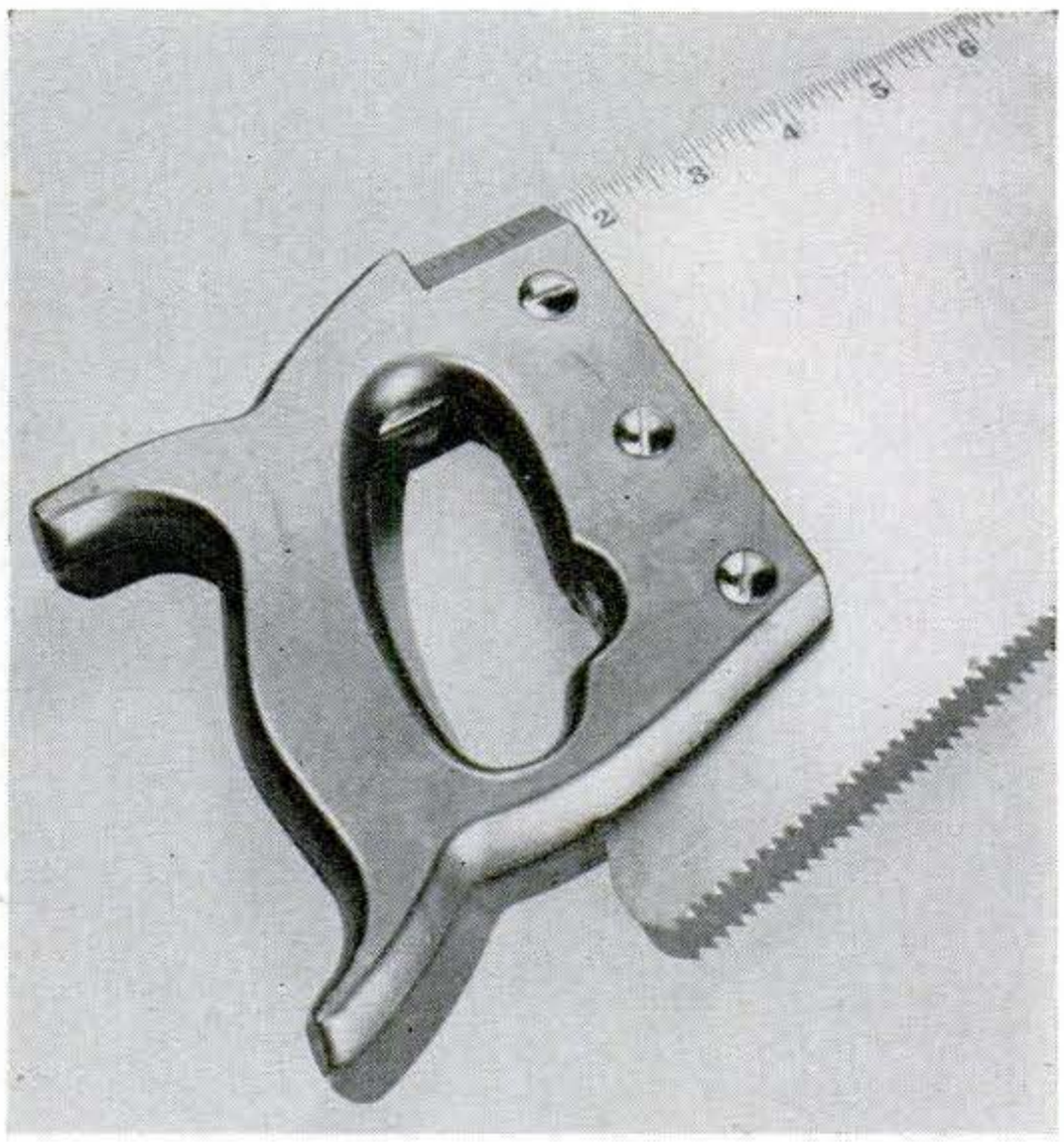




4. Wrench Grips Pipe or Nuts. An extra sliding jaw lets you hold either pipe or nuts with this convertible wrench. To grip a nut (above left), the jaw is slid to the top, providing two smooth surfaces. To grip pipe (center), the jaw is slid downward, providing two serrated surfaces. The rear parts of the fixed jaws form a wire cutter (right). The opening is quickly set by simply sliding the upper-jaw stem through the lower jaw. Pressure is then applied by squeezing the cam-action handle.

5. Extractor Loosens Screws. Rusted, frozen or badly mutilated screws are quickly jarred loose with this tool. Tapping with a mallet forces a cam on the handle against a pin in the blade, giving it a sharp twist. The tool will tighten or loosen both right- and left-hand threads, since the cam works in either direction.



6. Saw Is Five Tools in One. You can both lay out a job and cut the stock all with this one saw. Two bubble glasses mounted in the Tenite plastic handle provide a level and plumb. The straight back edge of the saw, graduated in sixteenths, is a rule. And with the inner edge of the handle, the saw forms a square.

Further information on the tools shown on this and the preceding page can be obtained from: 1. Toolkraft Corp., Plainfield St., Springfield, Mass.; 2. Irwin Auger Bit Co., Wilmington, Ohio; 3. Adjustable Clamp Co., 417 No. Ashland Ave., Chicago, Ill.; 4. Charles Geiger Co., 55 West 42nd St., NYC; 5. Eagle Products, Box 84A, Meriden, Conn.; 6. Joy Tool Co., Cornelius, Ore.

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Is your car pepless or hard to start? Maybe you can snap it up by learning

How to Keep an Automatic Choke Automatic

By E. F. Lindsley

TELL an English mechanic you suspect the strangler, and instead of calling a cop he will look at your automatic choke. If it is clogged with gum or carbon, the British name for this gadget is especially apt. It may be strangling the pep out of your engine.

Manual or automatic, a choke is basically a butterfly valve set in the air horn of the carburetor. Close it, and you get less air and more raw gas into the engine —fine for cold starting.

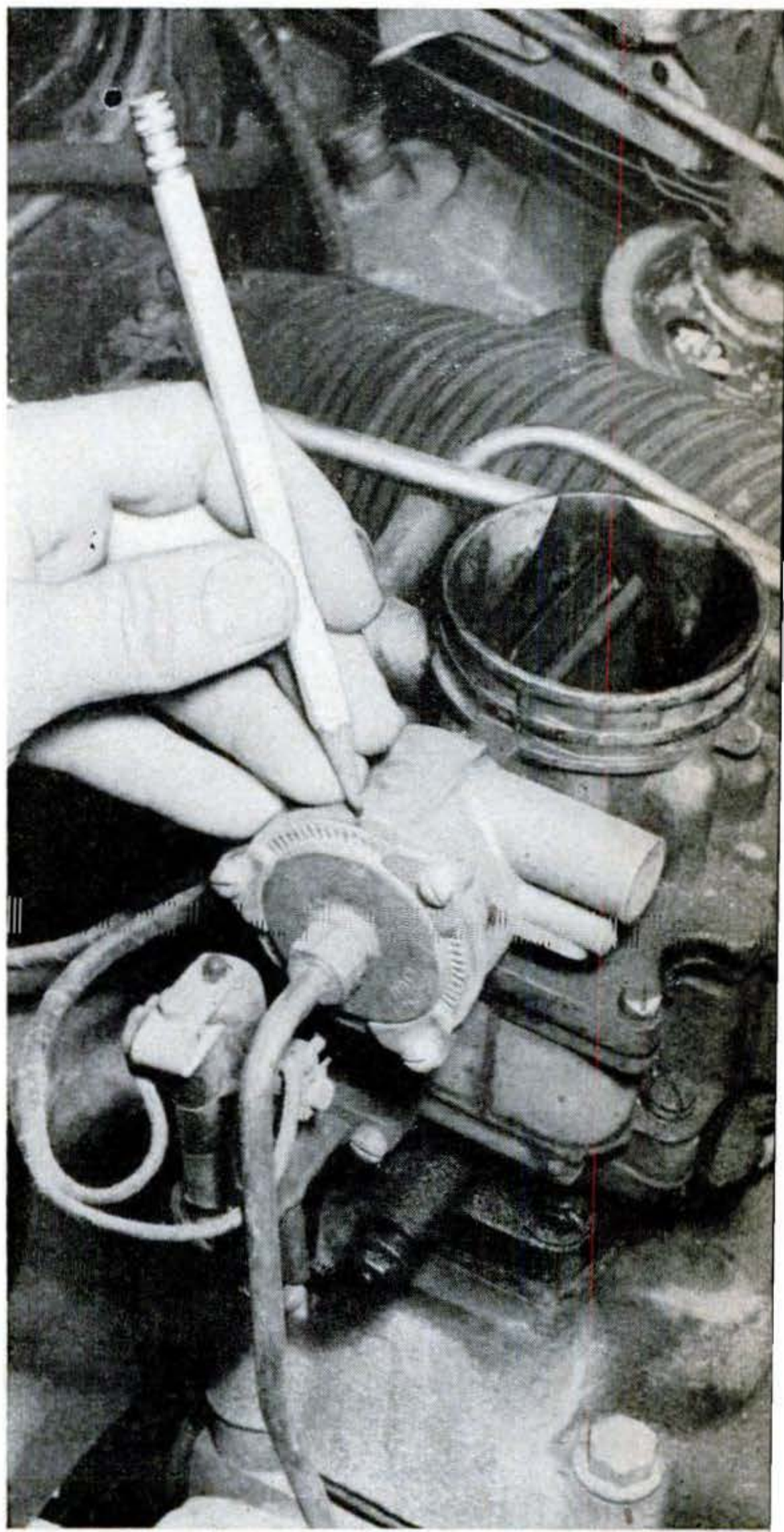
But once things are warm, this valve should open wide to let the engine breathe freely. If it doesn't, the pistons gulp gas; you'll get a rich mixture, a sluggish engine and a big gas bill.

That joke about the woman driver who complained of poor gas mileage but left the manual choke out to hang her pocketbook on is still good for a laugh—sometimes from the very fellow who drives around with a jammed automatic choke.

Heat turns the trick. What makes a choke automatic is a bimetallic thermostat wrapped like a coil spring around the shaft of the butterfly valve. The spring curls up tightly when cold, twisting the shaft around and closing the valve.

To keep it from shutting completely, the shaft isn't centered. This lets the air blast kick the valve open a bit against spring tension, like a barn door in the wind. It is helped along by a little piston that works on manifold vacuum. As soon as the engine takes off, the piston pulls against the thermostat spring, opening the choke part way.

As the engine warms up, hot exhaust gases are sucked up into the thermostat casing through a tube. The thermostat



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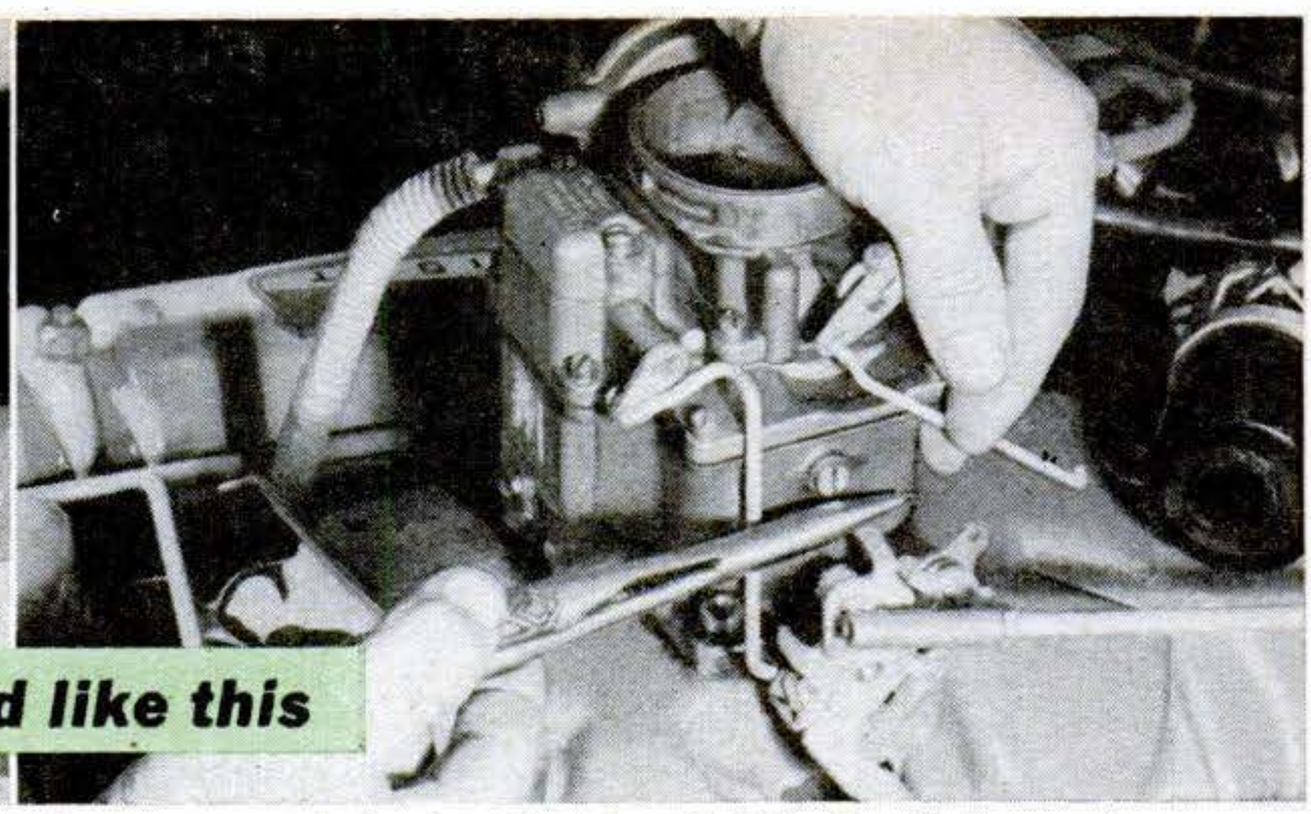
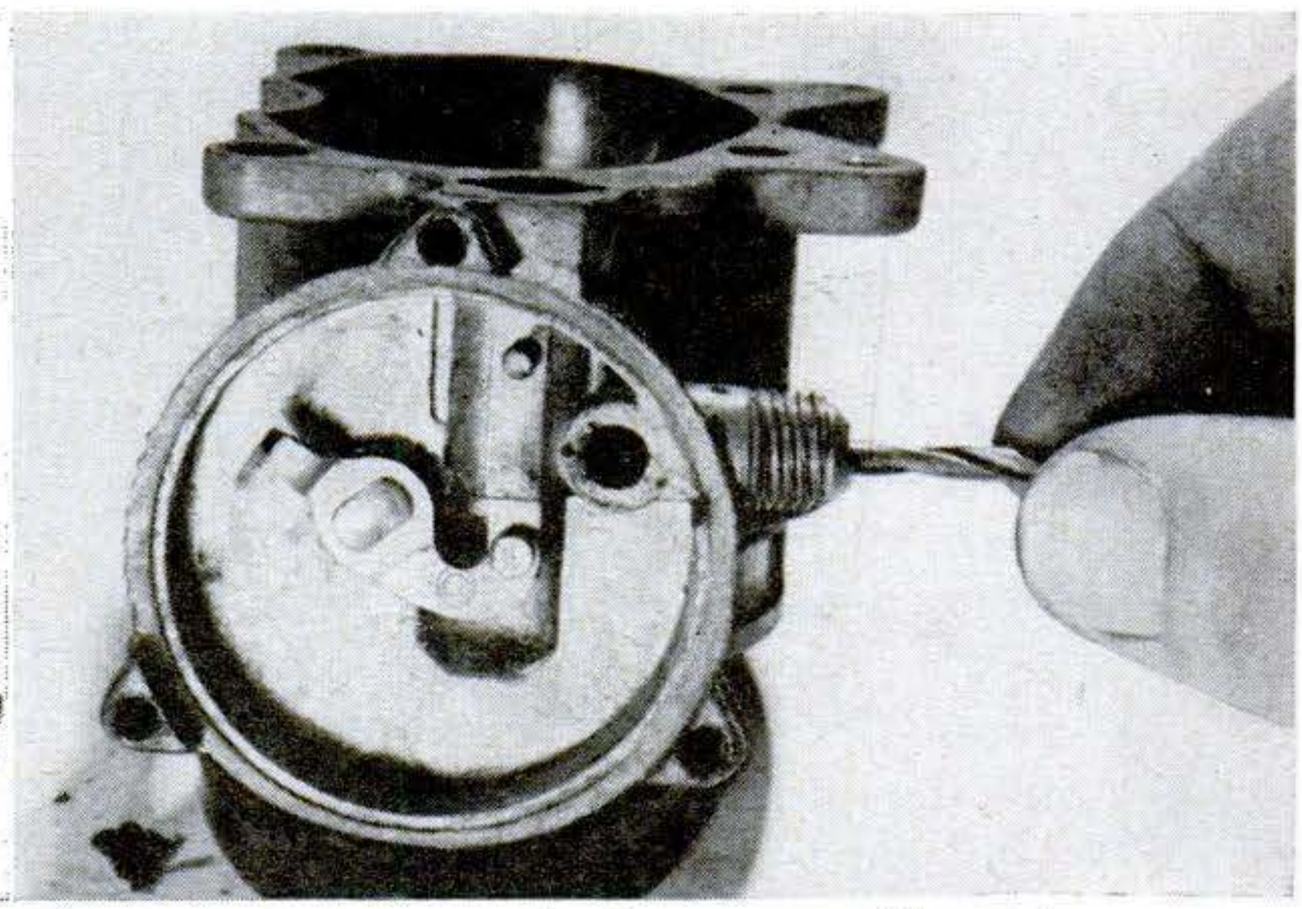
One standard make is cleaned like this



1 FIRST STEP in cleaning choke is to remove air cleaner. Next disconnect heat tube running from thermostat chamber to exhaust manifold. On this Carter automatic choke, tube is insulated against heat loss.

2 PULL OFF hairpin clip that holds the linkage arm connecting choke shaft to the fast-idle cam. Also take off unloader and high-speed-idle link. Then loosen the four screws holding the choke to the carburetor.

5 THIS MUCH DIRT in a thermostat casing indicates two things: it's high time to clean it, and the engine is probably burning oil. Above, knife points to clogged exhaust-heat passage that would delay choke opening.



6 WASH OUT as much dirt as possible with solvent. It will probably take a small drill to poke all hard carbon out of the passage. Don't forget to run the drill through mating passage in the carburetor, too.

relaxes in the heat, slacking off on the butterfly valve.

Choke trips the throttle. You'd think that would do it. But engineers, who seem to believe gadgets are better than people, have gone further by linking the choke to the throttle. Like it or not, this link is supposed to replace the old hand throttle you pulled out to keep the heater warm while you and the girl friend studied astronomy.

When the engine is cold and the choke closed, this link shoves a cam behind the throttle, so that it cannot close all the way. Thus your engine runs at a fast idle and won't stall readily.

When it warms up and the choke goes out of action, the link hauls the fast-idle cam around out of the way and the engine drops to normal idling speed.

There's another serious purpose for the fast-idle link. With the old hand choke, you shoved the button back in if the engine didn't catch pronto, and pulled it out slightly *after* starting. You knew that leaving the choke out too long would flood the engine. You're still expected to know that, but a lot of present-day drivers don't.

If the mill doesn't start promptly, the trick is to shove the foot throttle clear to the floor. A little gimmick called the un-

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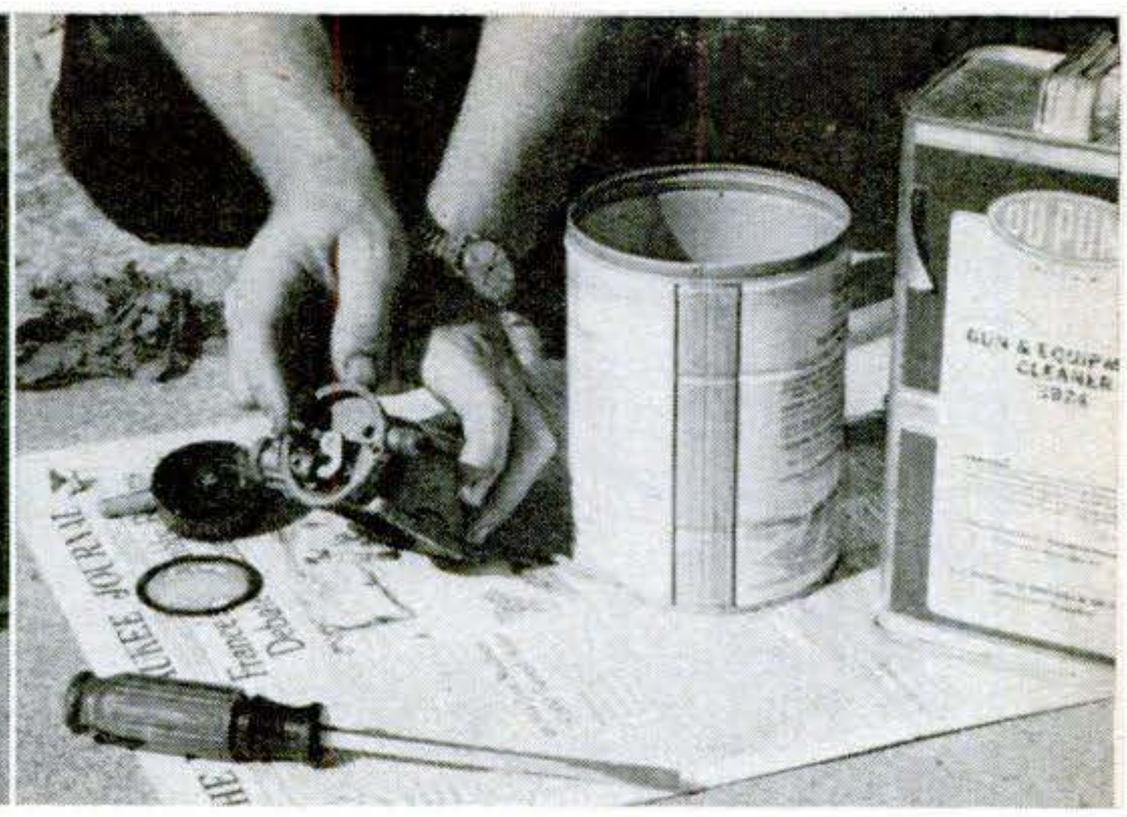
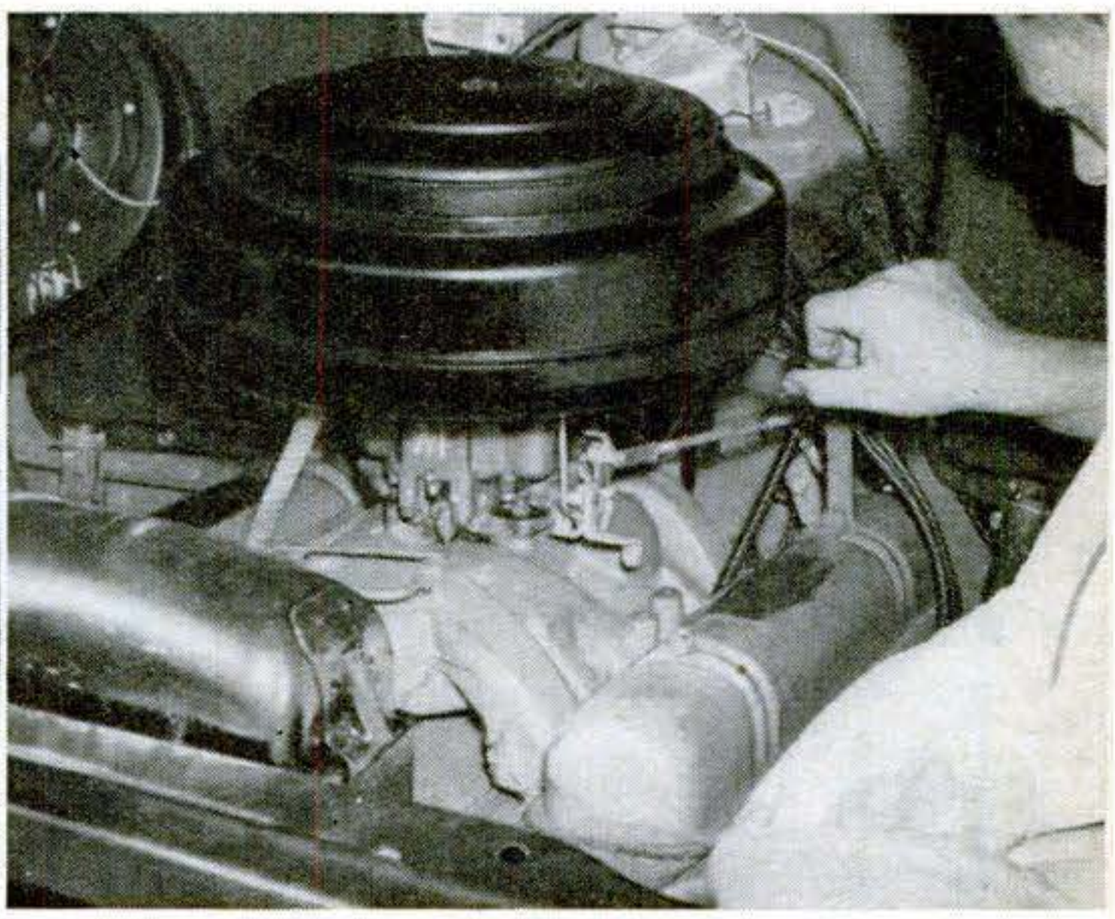
3 REMOVE COVER of thermostat casing and lay it aside (cleaning solvent may attack a plastic cover). Rinse choke body in lacquer thinner or spray-gun cleaner, using a brush to work the fluid into all tight spots.



4 RINSE AT LEAST TWICE in clean thinner, so that contaminated fluid will not redeposit fuel gum around shaft and vacuum piston as it dries. After last rinse, work piston to force fluid out of the passage.

7 NOW'S THE TIME to check the air cleaner. Replenish the oil if its level is low. If it is dirty, throw it out and replace with a heavy grade of fresh oil. A mark around the pot shows the correct filling level.



8 EASY DOES IT! Tighten the air-cleaner clamp snugly, but don't make it so tight that it cramps the choke valve in the air horn—an often unsuspected cause of automatic-choke trouble. Just clamp it securely.

loader trip then gives the fast-idle link a kick that opens the choke to clear the engine. Once it starts, you let up on the throttle and the choke goes back to work.

Like many simple things, the automatic choke gets complicated in practice. Spring tensions, clearances, cam contours and other details are carefully tailored to match carburetor and engine. So it's best not to monkey with choke adjustments unless you have a sporting attitude toward the whole thing, or the proper shop manual.

But you can clean it. Although engineered to a hair, an automatic choke can be put out of action by nothing more complex than fuel-gum and carbon deposits. Provided you don't try to redesign it with hacksaw and pliers, there is no reason why you can't keep it in working trim by cleaning it every 5,000 miles or so. This should pay off in better gas mileage and easier starting.

Probably the strategic times to check and clean the automatic choke are fall and spring. But if you didn't do it then, now is a good time, for in winter the choke has to do its stuff or you're going to be flagging someone for a push.

Fuel gum is stubborn stuff; gasoline and kerosene won't touch it. But it surrenders to ordinary lacquer thinner or

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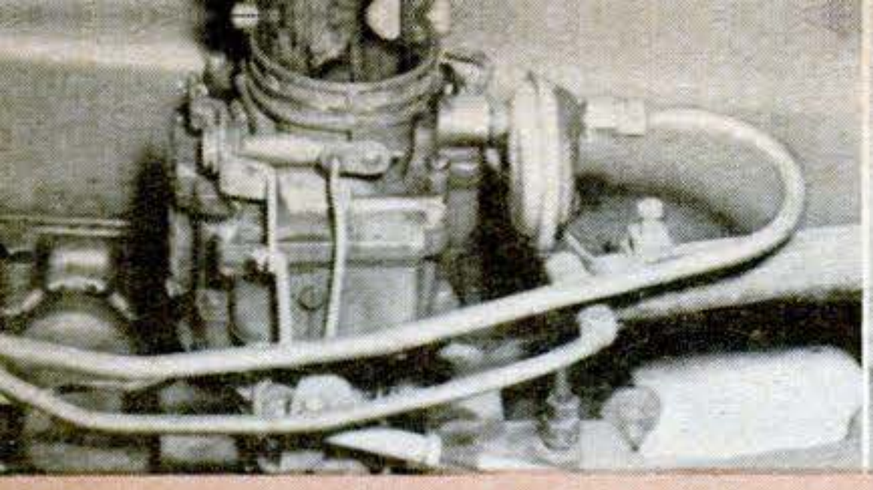
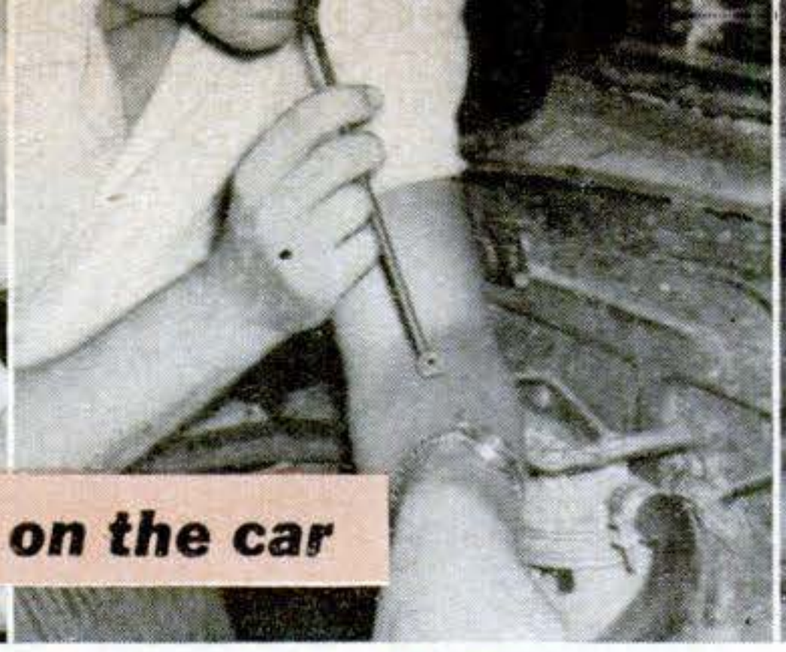
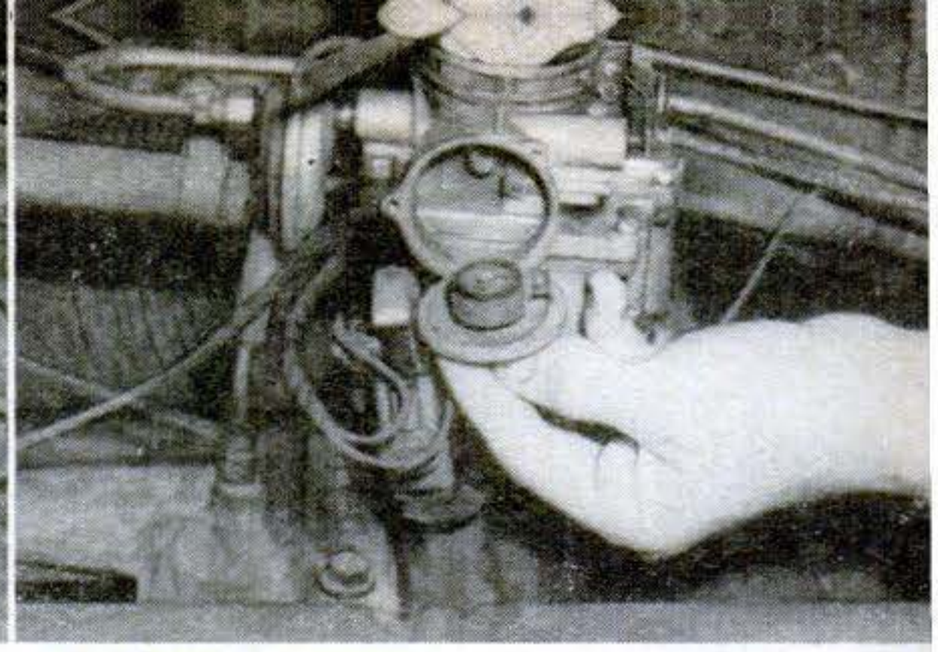




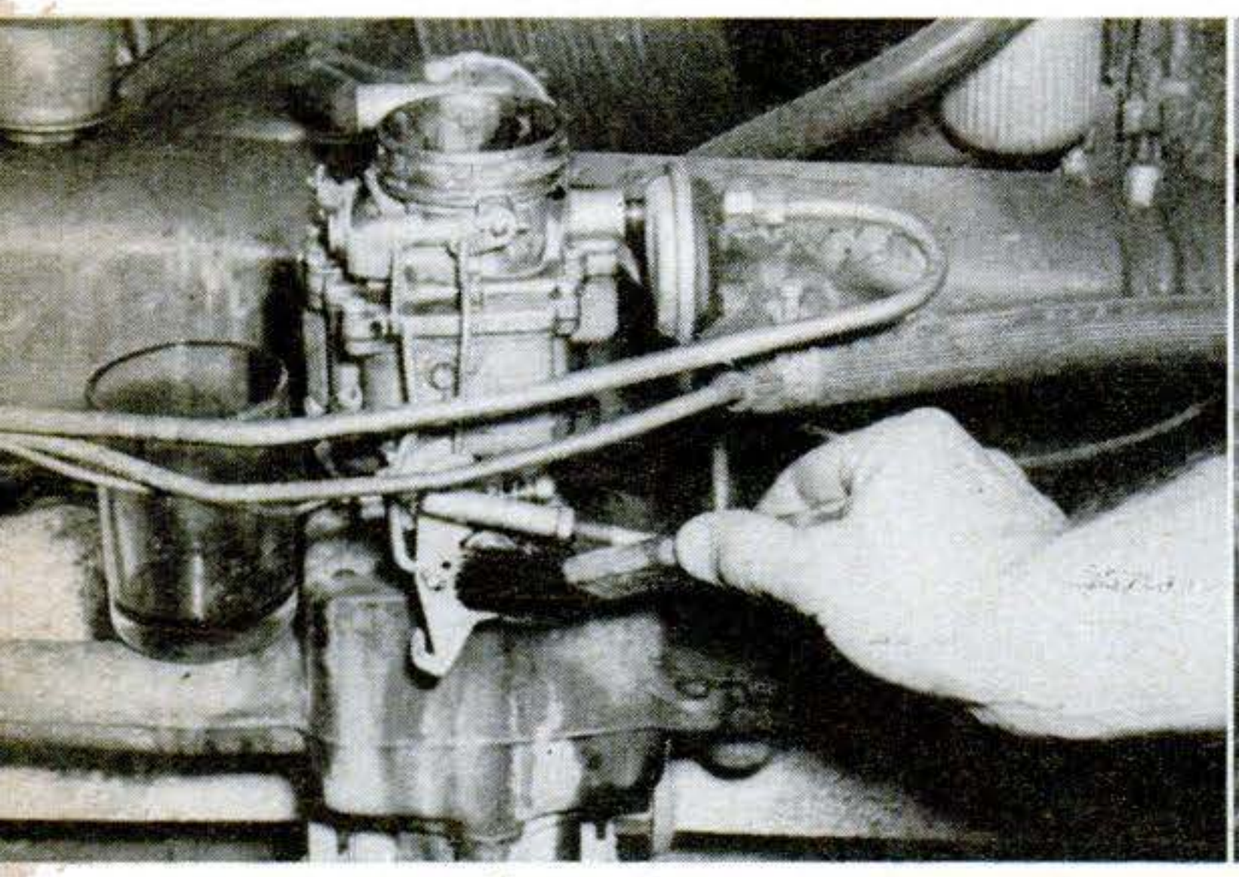


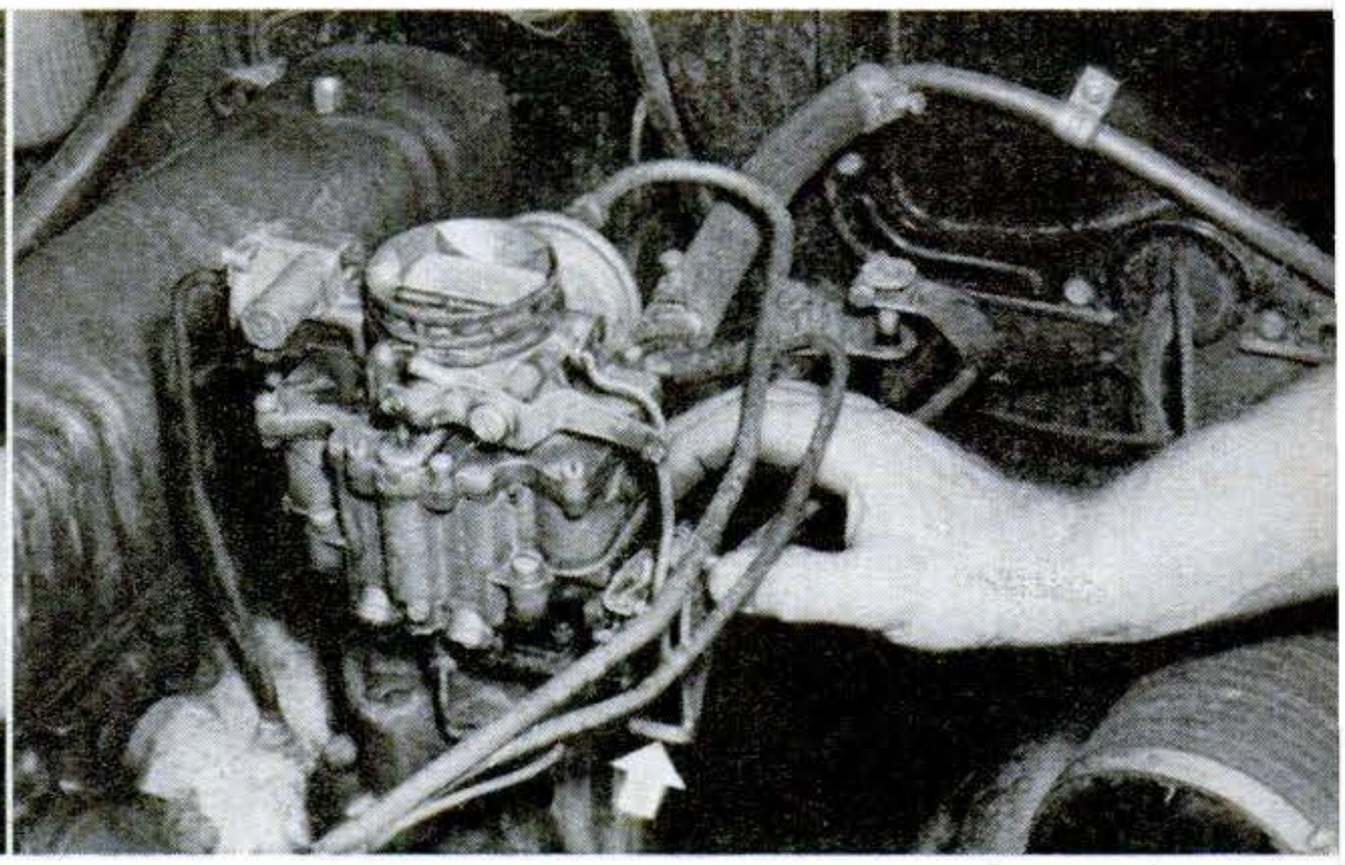
How unit can be cleaned on the car

1 ANOTHER TYPE OF CHOKE, the Stromberg, is shown here. **Note position of choke valve as you take off air cleaner. If engine is cold, it should be closed or should snap shut when foot throttle is nudged.**

2 EXHAUST-HEAT TUBE must be removed before thermostat **cover of this unit can be taken off. While you're at it, blow into the tube. If it's clogged with carbon, clean it out with solvent and a piece of wire.**

3 MAKE A NOTE of markings that show setting of cover **against thermostat tension. Remove cover and wash casing out with solvent. Be sure choke valve is free. Replace cover at same tension setting as before.**





4 USE A BRUSH to clean outside of carburetor and, more important, the fast-idle cam, throttle and various linkages. Lacquer thinner dissolves fuel gum, flushes away dirt. Leave parts clean and dry; they need no oil.

5 CHECK FAST IDLE. With engine cold, a touch on throttle should engage fast-idle cam. When gas is floorboarded, unloader tab (arrow) should snap choke partly open. If it doesn't, bend tab a little toward choke link.

the spray-gun cleaner shown in one of the photos, which is even cheaper. Half a pint will clean a choke.

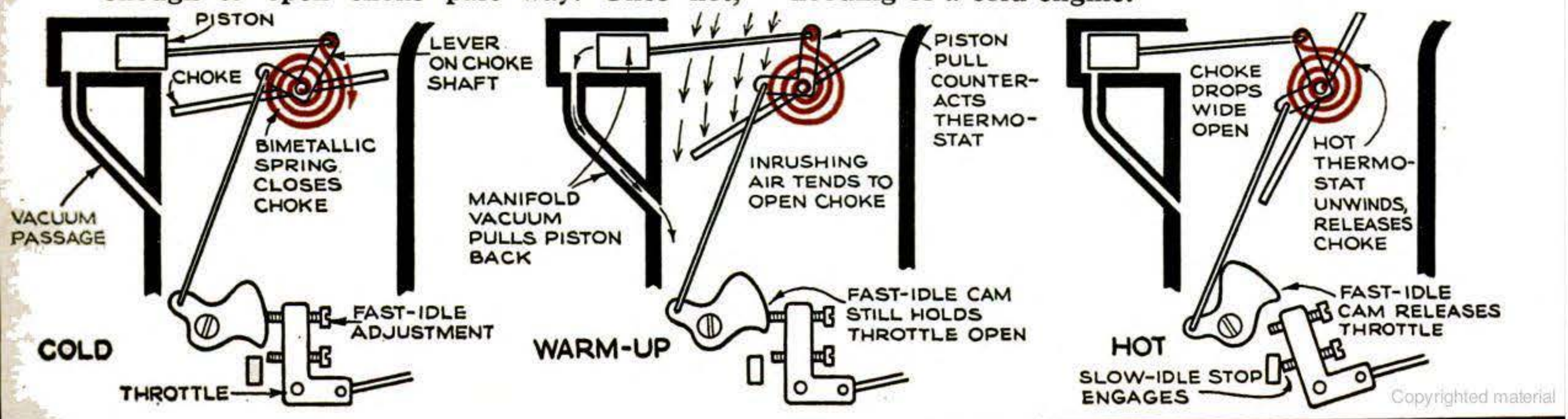
Cleaning must be done inside as well as out. Take care to get to the small vacuum piston and to both choke-shaft bearings. Wash away all red deposits. Then rinse and rerinse the parts, at the same time working them back and forth, until the thinner runs clear.

If your car has a Stromberg choke, you may not want to take off the whole top of the carburetor to get it loose.

[Continued on page 248]

Choke adapts itself to engine operating conditions

HERE'S WHAT HAPPENS after you get in the car. First touch on foot throttle lets fast-idle cam drop under its adjustment screw. It stays there during warm-up, while vacuum piston and air-horn draft buck thermostat tension enough to open choke part way. Once hot, thermostat relaxes, letting choke drop open and fast-idle cam ride off the throttle. Not shown here is the unloader tab, which forces choke open against thermostat tension when you push throttle down hard. This prevents flooding of a cold engine.



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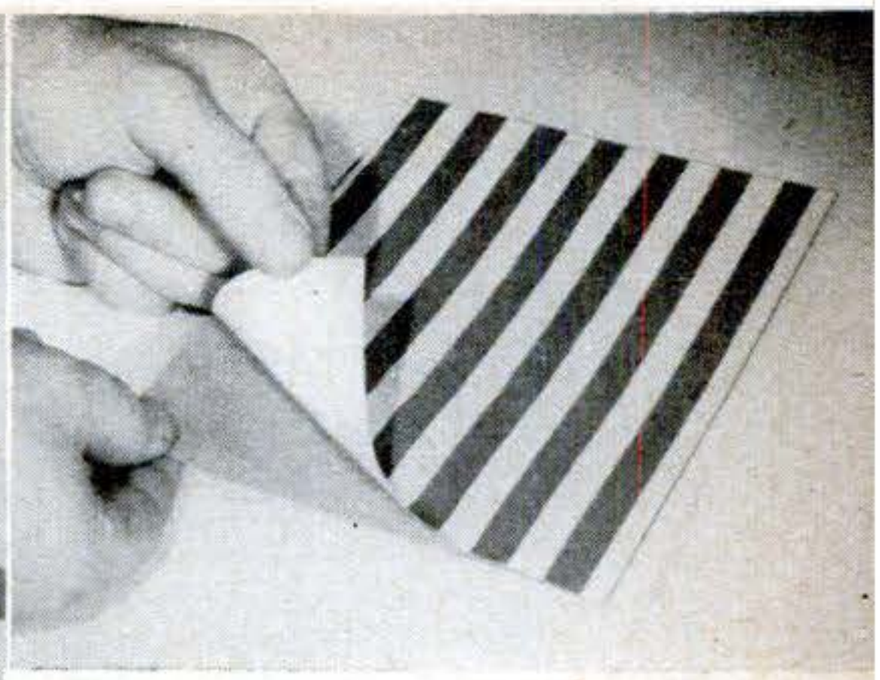
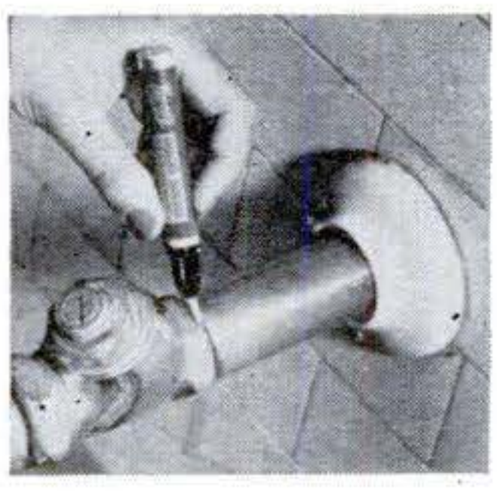


New for the Handy Man

1. Plastic Pastes Itself On. This flexible plastic wall and counter covering comes with the adhesive right on the back like a postage stamp—only you don't even have to lick it. A protective paper backing is simply peeled off and the plastic pressed against the surface. Besides large areas, the waterproof sheets can be used to cover furniture, shelves, small items like books, boxes and wastebaskets, and as wall decorations by pasting up colorful cutouts. It comes in 18″-wide rolls in solid colors, stripes, patterns, and wood-grain and marble effects. The plastic resists heat and marring.



2. Brush-On Solder. With this brush-tipped dispenser, you can cold-solder hard-to-reach joints. A constant flow of liquid solder keeps the brush wet, ready to apply.

3. Casters Adjust Furniture Height. If you have a piece of furniture that wobbles because the legs are uneven or the floor isn't flat, these casters can be adjusted to keep it steady and level. A knurled nut raises or lowers the threaded shaft like a screw jack. Once set, the shaft is kept from turning by keyways that lock it to the caster bushing, permitting the wheel to swivel without changing the height.

4. Screens Clip Over Gutters. Twigs and leaves can't clog your rain gutters with these screens clipped over them. Metal tabs are pressed down to grip the gutter, while the other edge slips under the shingles. The 3′ strips come 5″, 6″ and 7″ wide for box, round, and wood gutters.

Further information on the products shown on this page can be obtained from: 1. Monsanto Chemical Co., 445 Park Ave., NYC; 2. Tipon Corp., South Kearny, N.J.; 3. Adjustable Caster Co., 1411 Walnut St., Philadelphia, Pa.; 4. Steele Mfg. Co., 445 Winchester Ave., Ashland, Ky.

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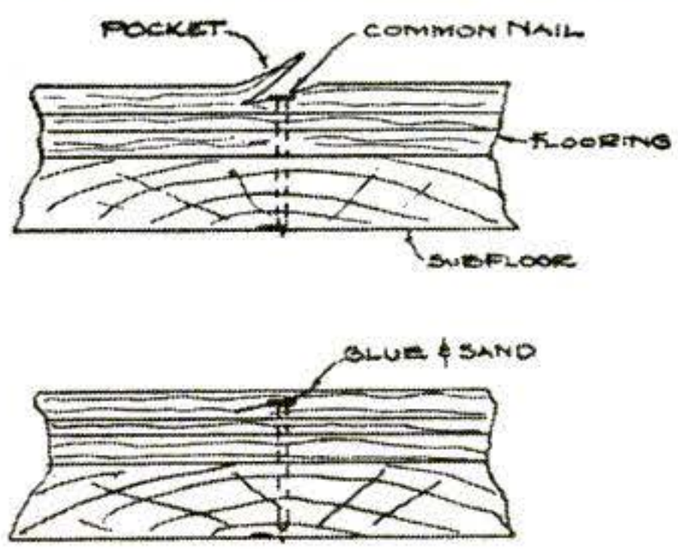
14 Different Ways to

By William B. Eagan

YOU sometimes hear it said that anybody can drive a nail. But simple as it seems, there are tricks of the trade that not only make work easier, but result in a better job, too.

Here, for instance, are 14 dodges that you may find handy in special cases:

1



Occasionally a common (headed) nail must be used for maximum drawing power, but the head should not show. In this case, the nail can be driven into a pocket as in **Fig. 1.** The pocket should be opened slightly larger than the head with a sharp, narrow wood chisel, parallel with the grain. Drive in the nail until the head is approximately 1/32″ above the surface of the wood, then sink it by using a larger nail, steel rod or nail set. Glue the flap of the pocket back into place, weight it down and sand smooth when dry.

2

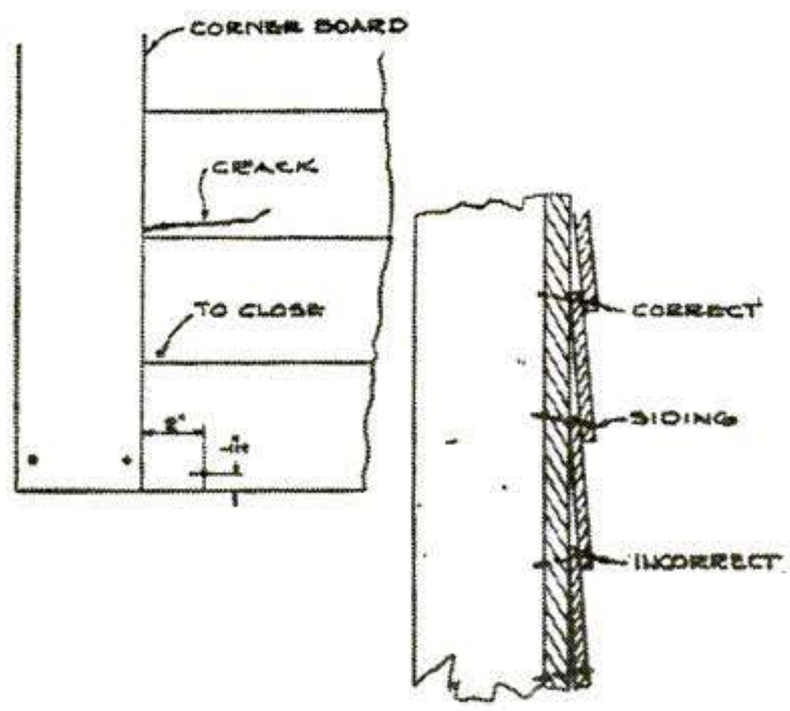
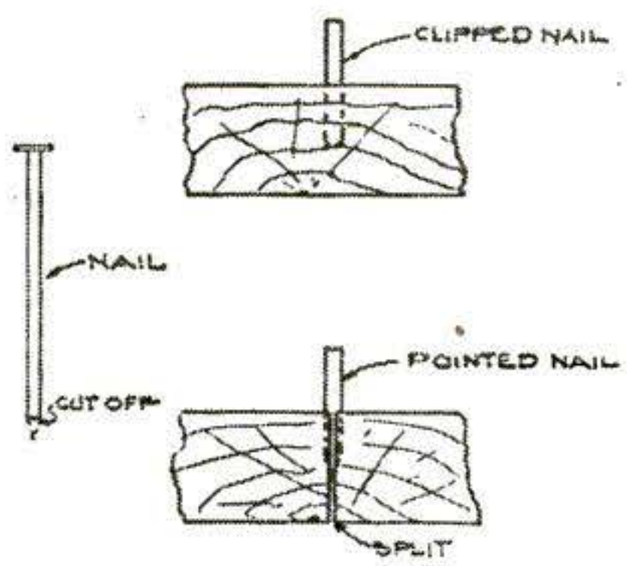


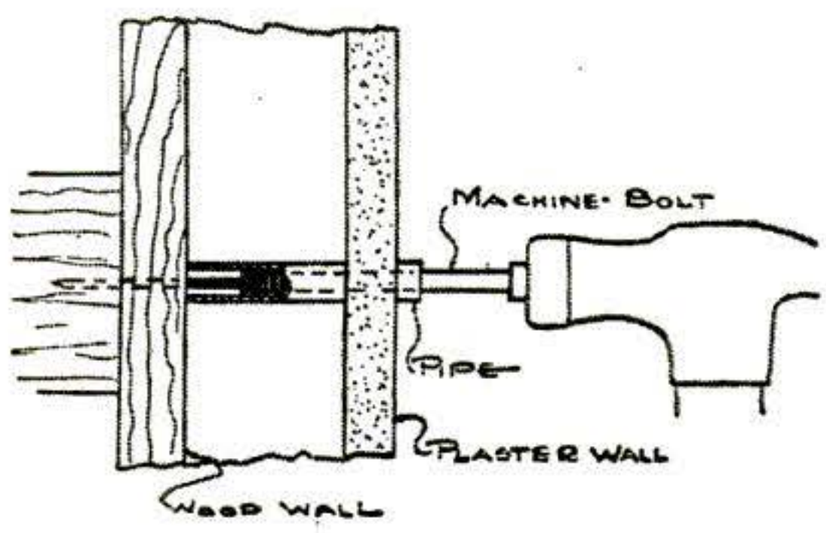
Fig. 2 illustrates what will happen when lapped siding is nailed too close to the corner board of a building. It also shows where to drive the nails to prevent splitting. Besides spotting nails properly, care must be taken to slant them upward instead of down. Upward-slanting nails, set and filled with putty, throw off rain water instead of guiding it into the wood.

3



There are a number of ways you can keep wood from splitting when driving nails. Drilling a guide hole is one. Driving a hole with a smaller nail is another. A third good dodge, which takes little extra time, is to clip off the point of the nail that you are going to drive, as in **Fig. 3.** The sharp edges of the cut nail will cut the grain, whereas the point would act like a wedge, causing the wood to split.

4



If a fixture must be fastened to a wooden wall that is backed up by a plaster wall, use the setup shown in **Fig. 4** to avoid damage to the plaster. Drill a hole in the plaster for a length of pipe slightly larger in inside diameter than the head of the nail. The nail is inserted into

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Drive Nails

Besides learning how to avoid a mashed thumb, you should know some tricks for special cases.

the pipe and a long machine bolt is used to drive the nail into the wall and fixture. Then the pipe is withdrawn and the hole in the plaster patched.

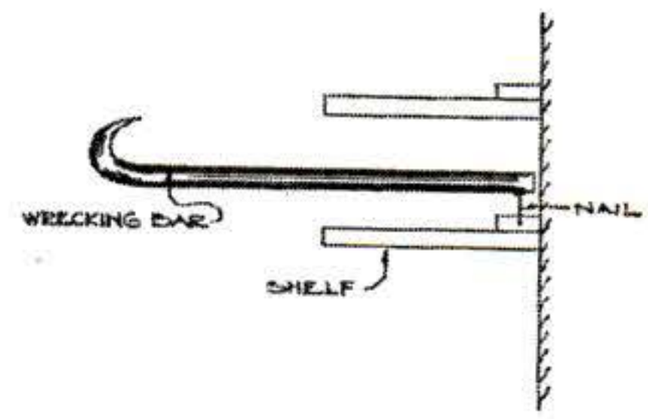
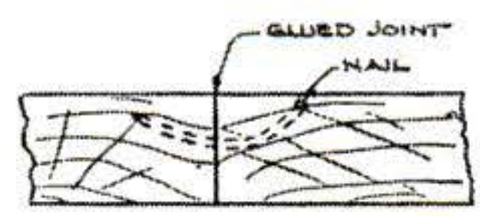
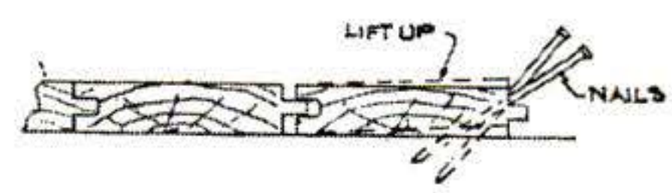


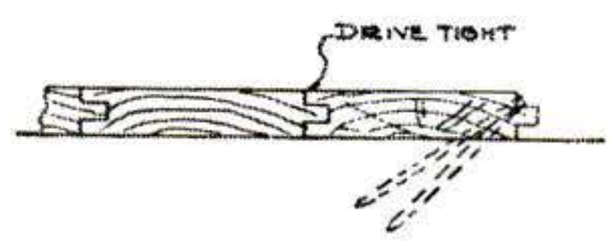
Fig. 5 shows how to drive a nail that cannot be reached with a hammer. Hold a wrecking bar upon the nailhead with one hand and strike the bar as near as possible to the nail. Many similar problems of close-quarters nailing can be solved this way.

Boards that must be glued edge to edge can often be given added strength by doweling them together with finishing nails as in **Fig. 6.** These are driven in while the clamps are still on the boards. Each nail is directed crosswise to the joint by bending its point slightly and starting it at an angle of about 45°, with the point upward. Stagger the nails from board to board.

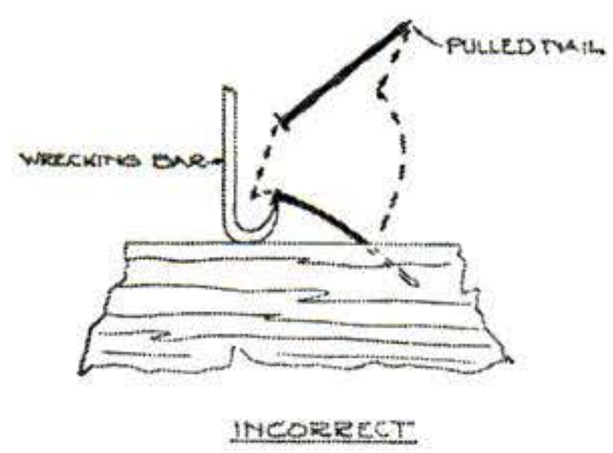


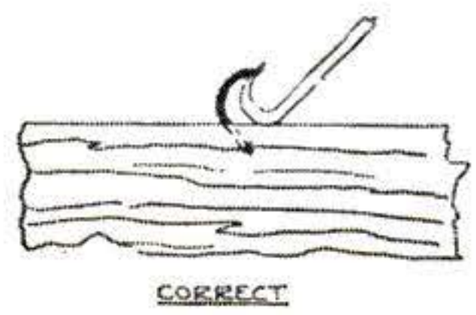
One of the most important tricks you should learn about driving nails is that of drawing up flooring boards with nails. **Fig. 7** shows how two nails in the same joist are started into a flooring board at different angles. This leaves enough space between them to afford each maximum grip. The board must be raised slightly when the nails are started so that the points enter the subfloor farther ahead than they normally would with the board lying flat. This gives the nails extra purchase to move forward and tighten the joint. You'll find this type of nailing particularly useful where boards are bowed and must be forced in to tighten them up.





One way to keep a nail from flying up and endangering the eyes when it is pulled with a wrecking bar is shown in **Fig. 8.** Instead of pulling it as in the top drawing, hook the bar close to the nail and pull the opposite way from the nail's slant.





Anyone who has ever had to nail a long board at the end, without having someone hold the other end, knows what a bother it is to keep it level. The next time this happens to

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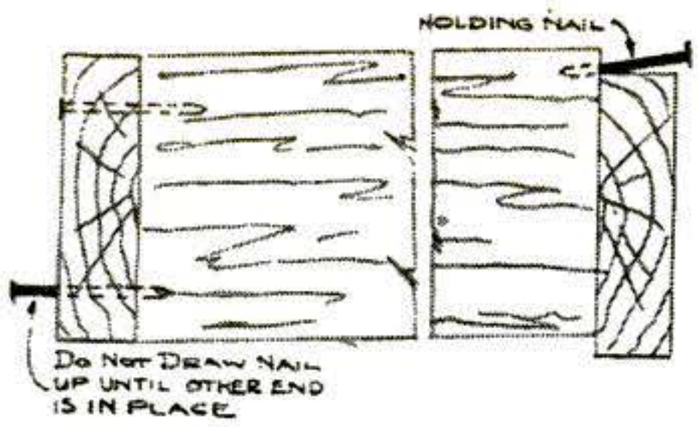
9



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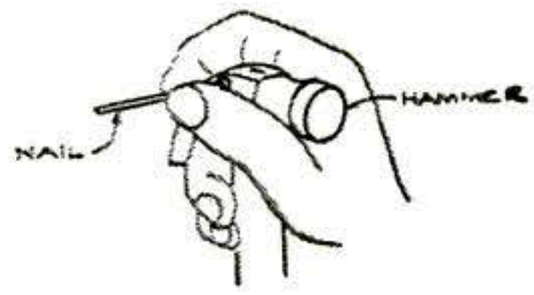

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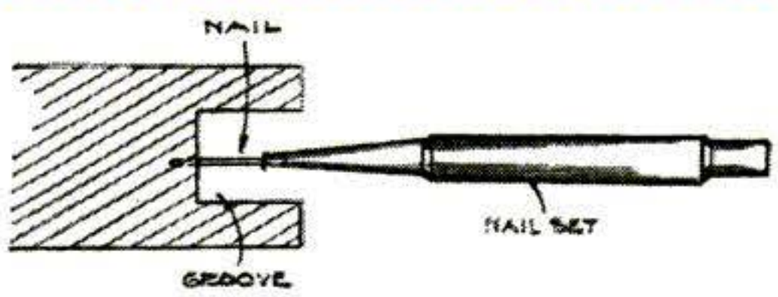

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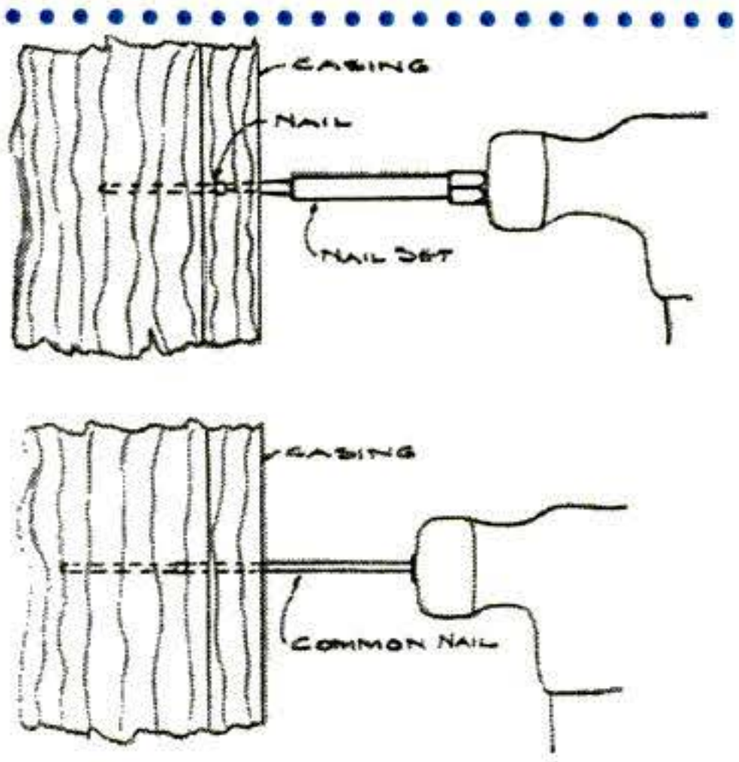

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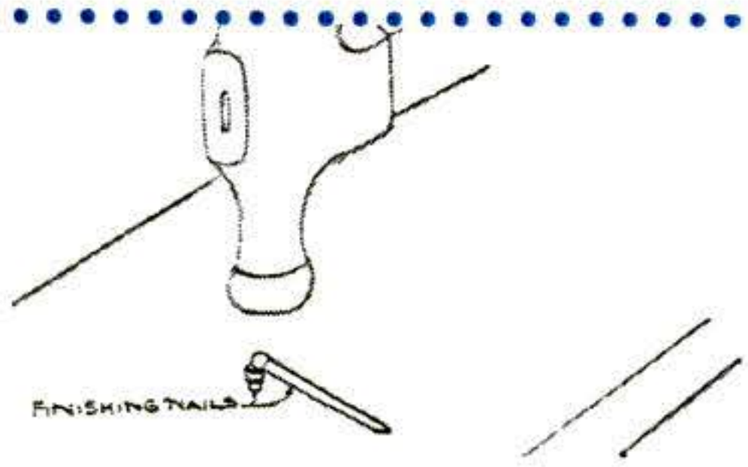

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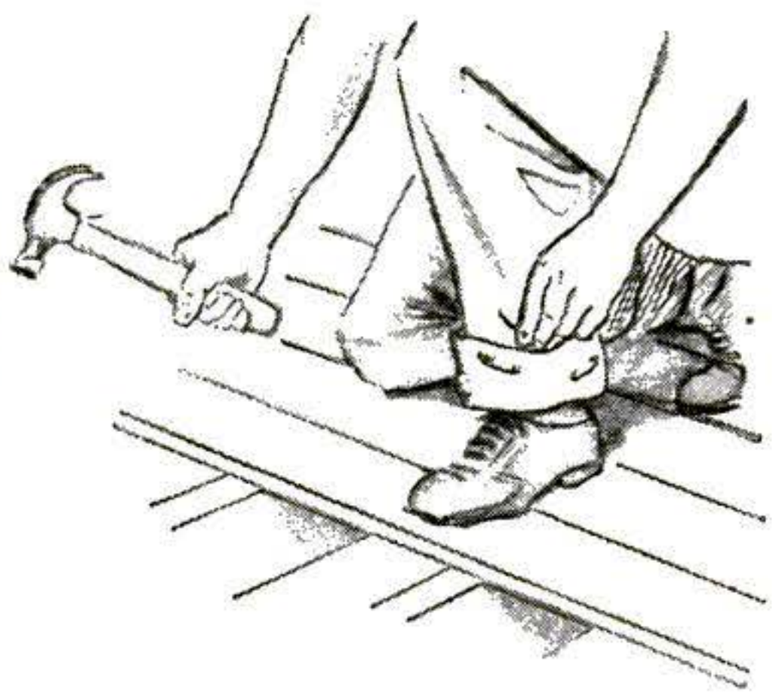

you try the simple trick of driving a nail in the top of one end of the board to support it, as at right in **Fig. 9.** When you've started nails in the other end, simply pull the holding nail at the first end, level the board and nail that end.

Starting nails, or "sticking" them as it is called, is usually done by holding the nail with one hand and tapping it with a hammer. But you can also use the method shown in **Fig. 10.** Wrap the fingers around the hammer head so that they hold the head of the nail against the cheek of the hammer. Thus the force of the blow on the nail will be taken up by the head of the hammer. This is useful where both hands cannot be used.

Where a nail must be driven in close quarters, but cannot be held with the fingers and driven with a hammer, the method illustrated in **Fig. 11** will be useful. Start the nail by jabbing it in with a pair of pliers. Then drive it with a nail set.

Sometimes window casings and baseboards must be removed for various reasons. Therefore the nails holding them must be sunk deep enough to free the boards. As shown in **Fig. 12,** the first step is to sink the nail as far as possible with a nail set without making a large hole. Then drive the nail the remainder of the way through the casing with a common nail that has had the point ground or filed off. This nail can then be removed with a claw hammer.

The method of setting nails shown in **Fig. 13** is to be used only in an emergency, since the preferred way is to use a nail set. The nail should first be driven as far as possible without making hammer marks on the surface. Then the head can be driven below the surface by striking it with a second nail as shown.

To speed up laying hardwood flooring and make it easier on your back, carry the nails in a pouch made by rolling your trouser leg up one turn. Pin it with safety pins to form a pocket as in **Fig. 14.** With the nails a few inches from where they are to be driven, you won't have to straighten up and reach into a waist apron. END

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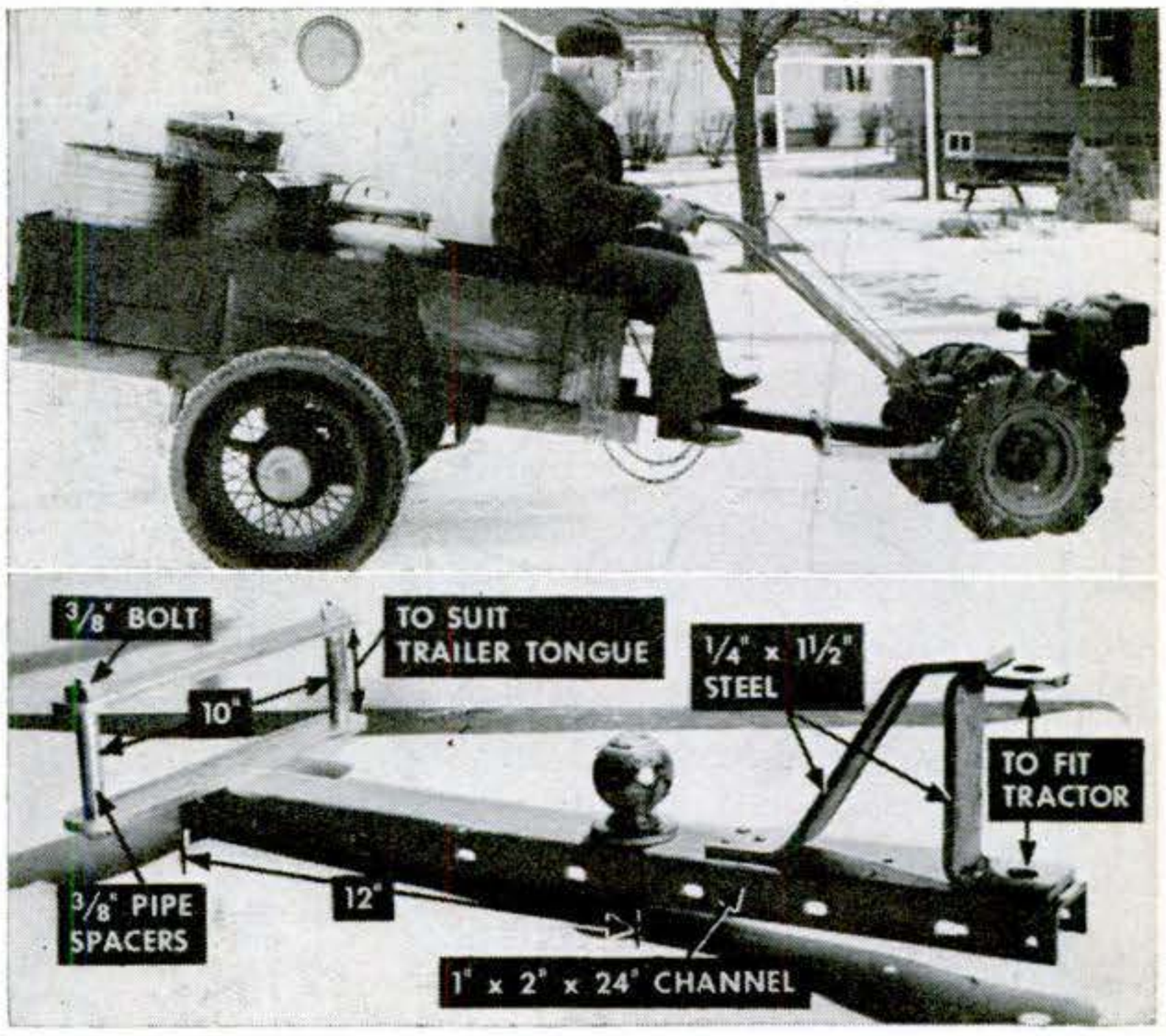
Special Trailer Hitch Lets You Ride Behind Walking Tractor

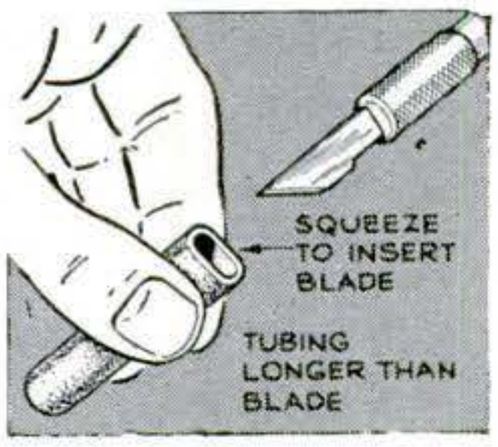
HERE'S a special hitch I made to haul a regular two-wheel trailer behind a walking garden tractor. The arrangement permits me to ride on the trailer while steering the tractor ahead of me.

The ball serves as the steering pivot point after the forward end of the trailer tongue has been attached to it. The tractor is held level by the crossbar assembly behind the ball within which the tongue is free to move sideways.

If an outfit like this is to be used on hilly terrain, a hand friction brake can be attached to the trailer wheel. Normally, the brake is used so seldom that wear on the tire is negligible.—*T. L. Stalker, Flint, Mich.*



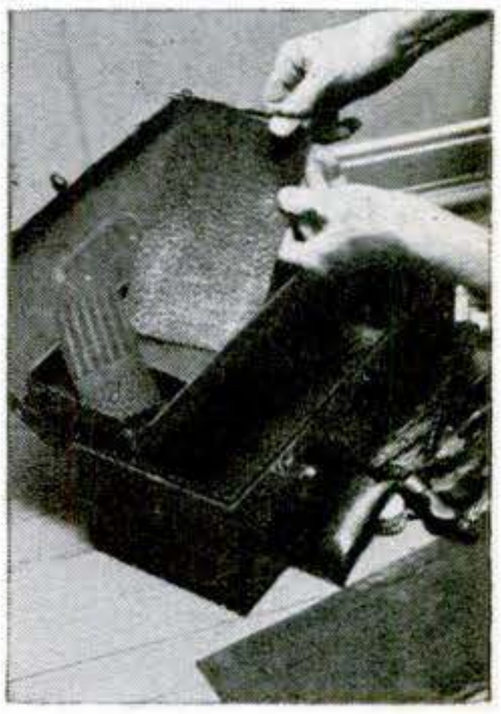
Rubber Tubing Sheathes Knife



WHEN you carry a modelmaker's knife in your tool kit or keep it in a drawer, you can protect its keen edge — and your fingers — by slipping a piece of soft rubber tubing over the blade. By pinching the tubing to an oval shape, the knife is easily inserted in its sheath.—*George Walton, Sharonville, Ohio.*

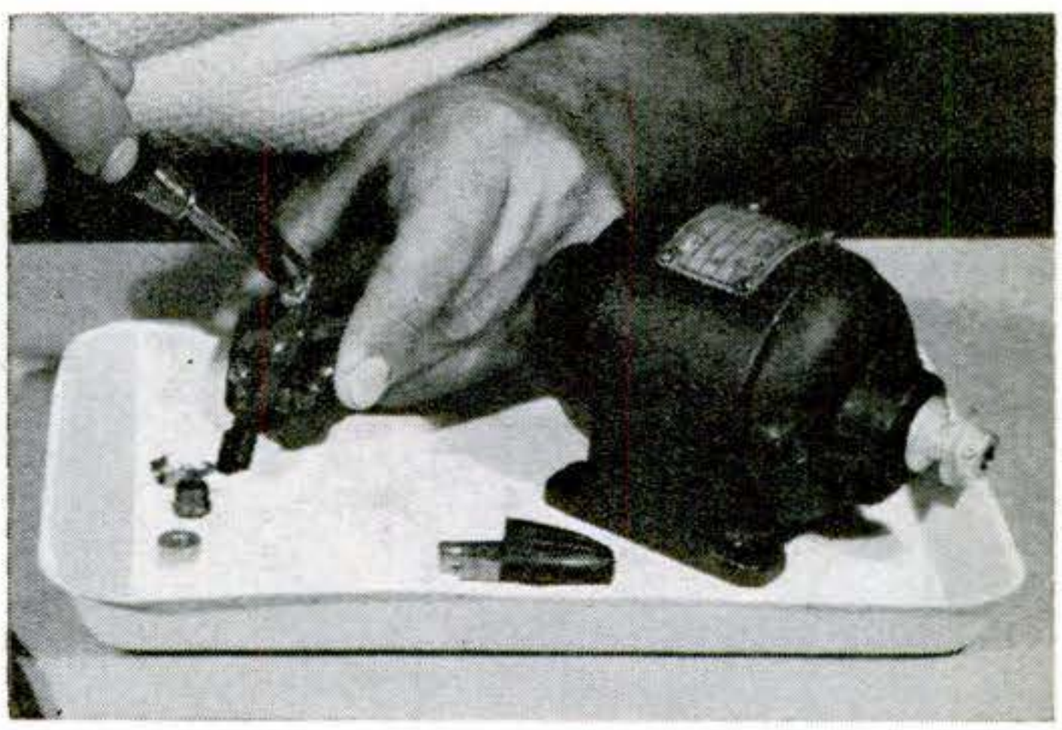
Floor Pad Lines Toolbox

HERE'S a good use for an old floor mat from your car or perhaps a rubber stair mat. Cut rectangles of the right size for each compartment of a metal toolbox. This will deaden noise as well as protect the tools.—*Bill Crane, Oklahoma City, Okla.*



My Washers Are Now Pin-Ups

YOU know how annoying it can be to fumble through a whole drawer full of assorted washers looking for a specific size. Yet there usually aren't enough of one size to devote an entire drawer to them. I solved the problem by placing each size on its own safety pin.—*W. Thomas, Buffalo, N.Y.*



Salvage from the Meat Counter

CARDBOARD containers in which you buy packaged meats at self-service markets are ideal work trays for a home shop. The trays, which come in various sizes, are often useful for storage of jobs that cannot be completed in one sitting.—*Irving Zeichner, Bronx, N.Y.*

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Twin Desks Take Less Space Than One

Back to back or side by side, these desks team up, when the youngster's lessons are done, into a sightly storage cabinet.

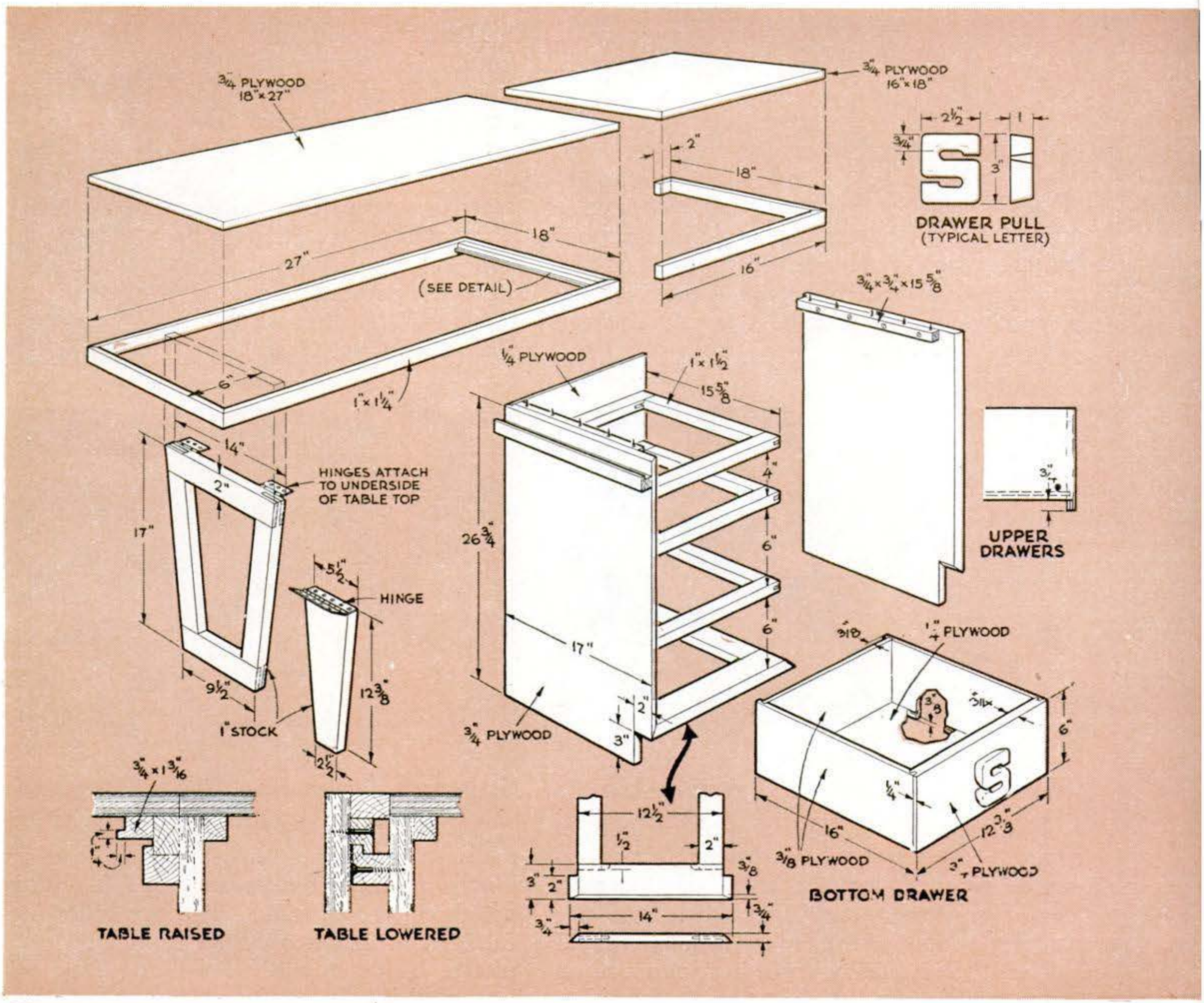
By Bernard I. Bell

INGENUITY and simple carpentry solved the teen-age work-space problem in our home. In an already crowded room, one large desk would have taken too much floor area. But by building two small chests of drawers with table extensions that can be folded against their sides, we gave each of our daughters a desk of her own—and the pride of individual ownership.

What's more, these matched desks are both handsome and adaptable. The lowered table extensions frame the drawers attractively, and the counterpart design of the desks produces a symmetrical effect, whether they are placed side by side or back to back.

You can build a similar pair of matched modern desks with the simplest shop tools. Construction methods are shown in the exploded drawing. You can easily change the over-all dimensions to suit your own needs.

The large surfaces are plywood. The



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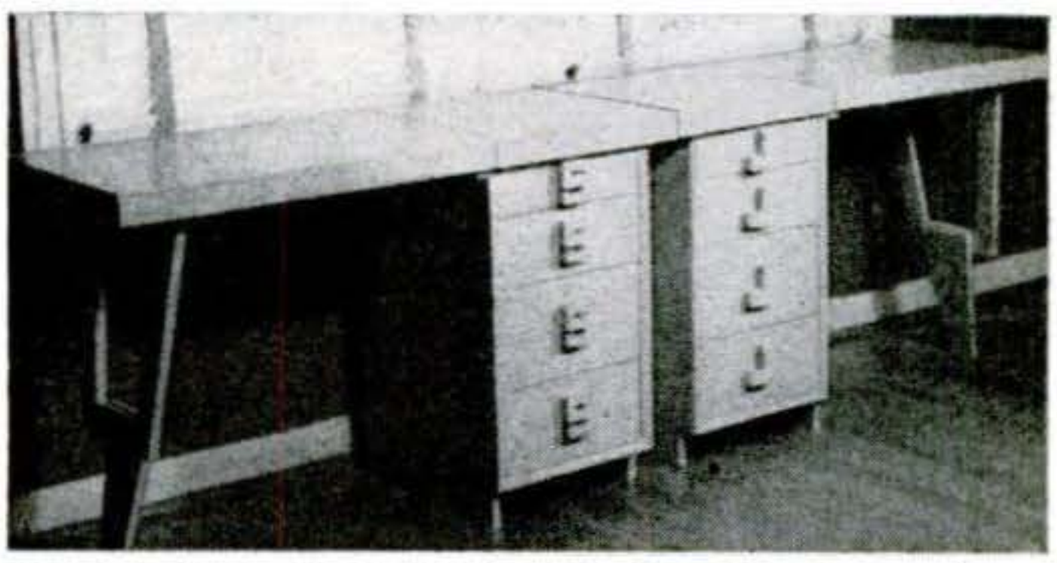
legs, table edging and drawer-guide frames are all ripped from one-inch stock. Joints are mitered or mortised as indicated, and assembly is with resin glue and wood screws. A gloss-enamel finish is more practical than wood stain for young people's furniture.

The only tricky fittings are the lap-joint arrangements that hold the table extensions in alignment with the tops of the chests, or firmly against their sides when the desks are not in use. L-shaped cleats do the trick, as shown in the cross-sectional detail drawings. When the outer ends of the table extensions are raised, and the hinged legs have been lowered and snapped out at the bottom, the tops are put under tension, producing a rigid assembly.

To collapse the desks, the lower halves of the legs are folded up, releasing the desk tops. The tops are then placed vertically against the sides of the chests and slid downward, engaging the L-shaped cleats.

You can add a personalized touch to your matched desks by running off initialed drawer pulls with a scroll saw. Tilt the saw table to give them an inward bevel. This provides a better grip. END

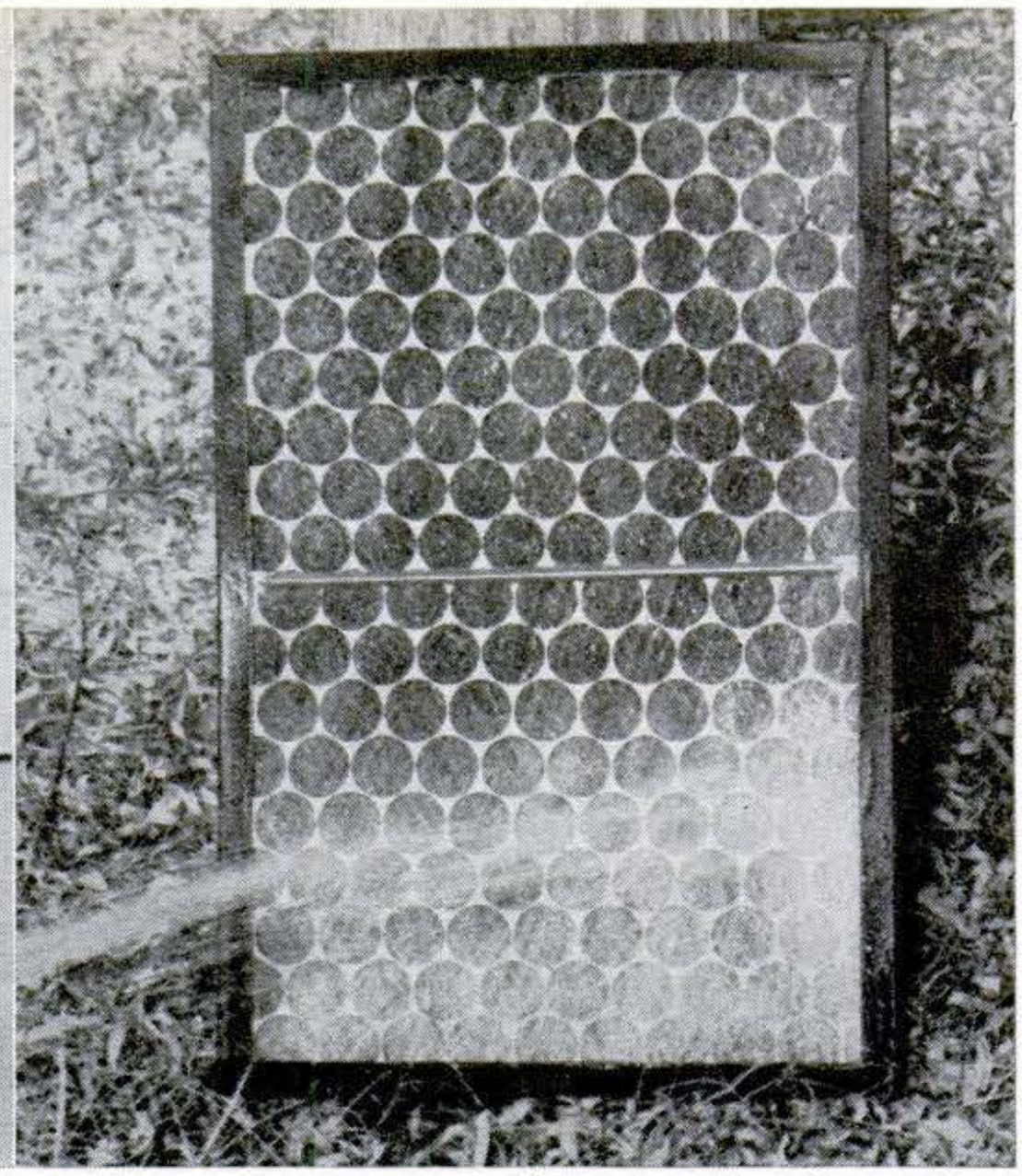
NO WASTE SPACE here. When homework or that very important letter is finished, desks, with tops down, become compact chest of drawers.



UP GO THE DRAWER-FRAMING SIDES, to form flush table-top extensions. Hinged legs hold the cleated joints under tension.

HERE'S ANOTHER ARRANGEMENT made possible by the twin desks' counterpart design. All chest drawers are accessible, either way.

TO AVOID SOAKING FILTERS in water, pour cleaning solvent over them after pulling out loose dust with vacuum cleaner. Work outdoors and catch the solvent in a large basin, re-using it as the dirt settles to the bottom.



LIGHT WATER SPRAY from garden hose then flushes out solvent-loosened dirt. Shake filters dry quickly before water soaks into the paper binding. Blower end of the vacuum cleaner can be used to hasten the drying process.

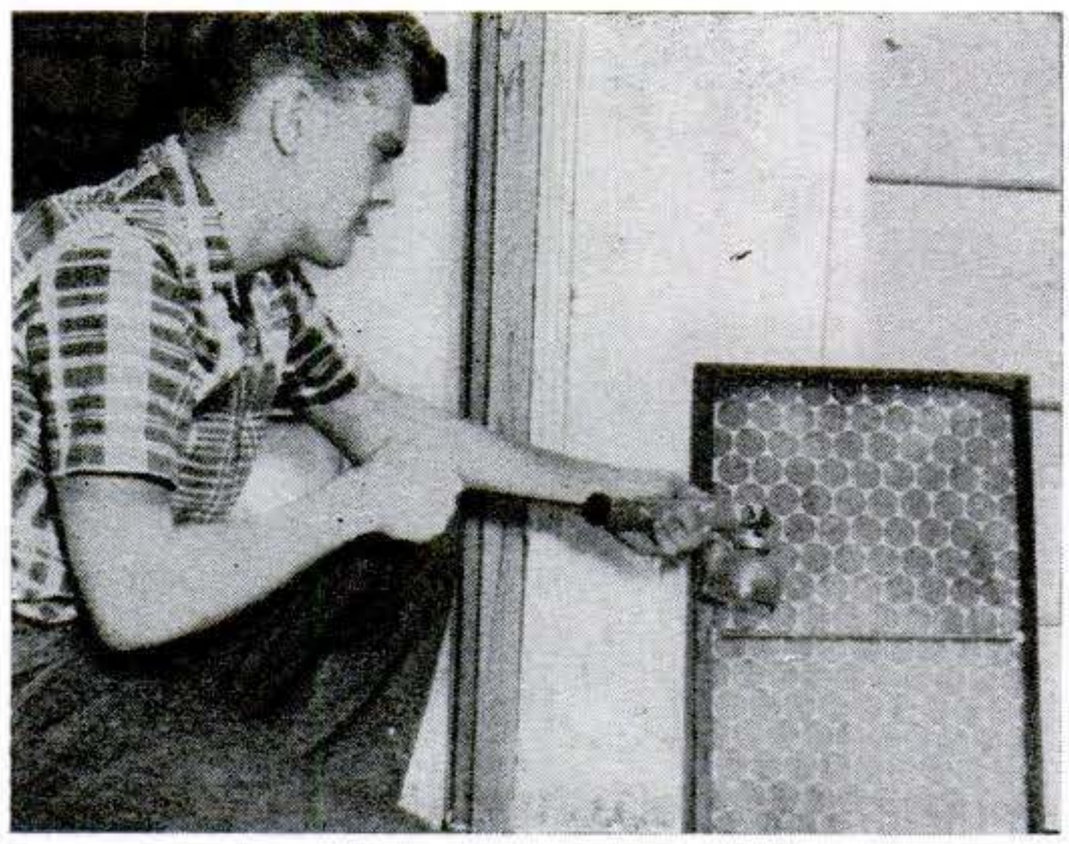
You Can Clean Furnace Filters

Clogged air filters rob your home of heat. A cleaning now will put them back on the job quicker'n you can say, "Brrr."

IF IT seems to be getting colder where you live, now is a good time to take a look at your furnace filters before you blame the weatherman.

Dirt-clogged filters can rob a hot-air heating system of much of its efficiency by choking off its breathing passages. Even though the paper binding prevents the filters from being washed, I've found you can clean them quickly and effectively by the method shown, which keeps the use of water down to a minimum.

You not only save the cost of new filters, but will have a more efficient heating system since you can clean the filters more often than you'd probably replace them. Two cleanings during the heating season, once at the start and again about now, will keep your filters breathing easily. If you use the same system for hot-weather cooling, better add a spring and midsummer cleaning, too. I've bought only two sets of filters in seven years, and they're still working fine.—*Warner Walker, Exeter, Calif.*



SPRAY LIGHT OIL on the side of the filter that faces the flow of air to keep dust from getting by. This would be the outside of the cold-air return filter and the inside of the main duct filter. An aerosol oil bomb is handy for applying oil mist to the filters.

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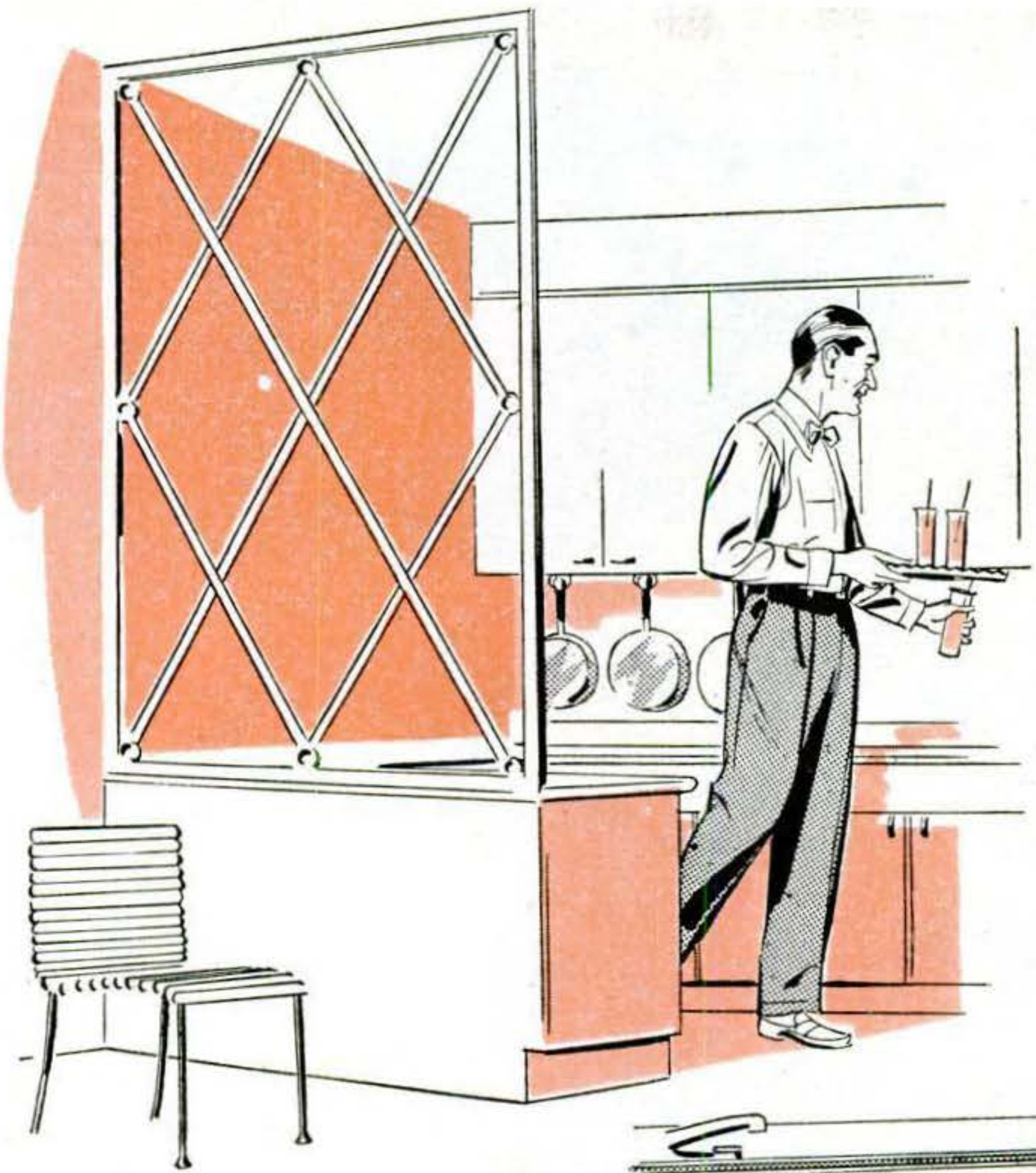
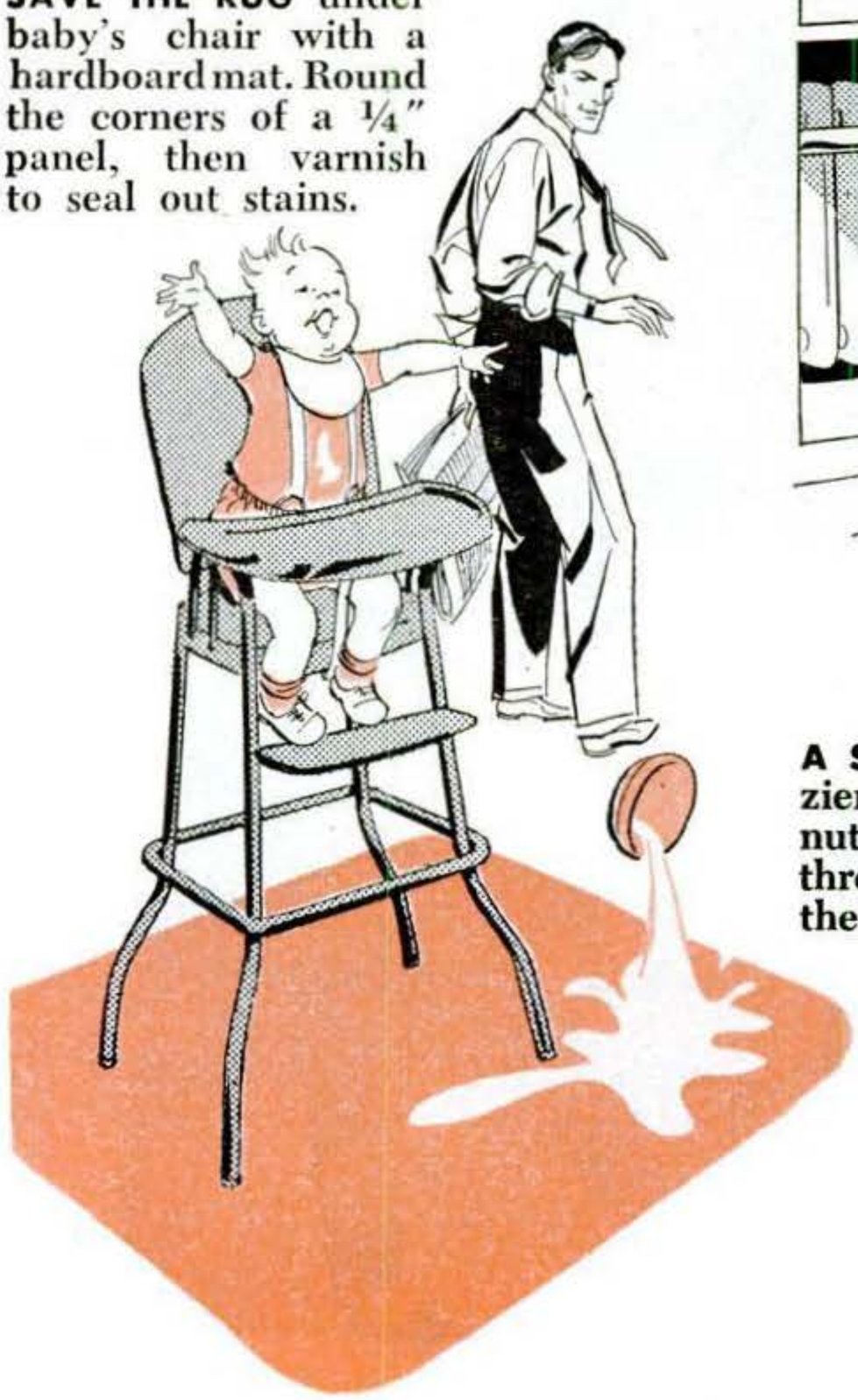
KEEPING THE Home SHIPSHAPE



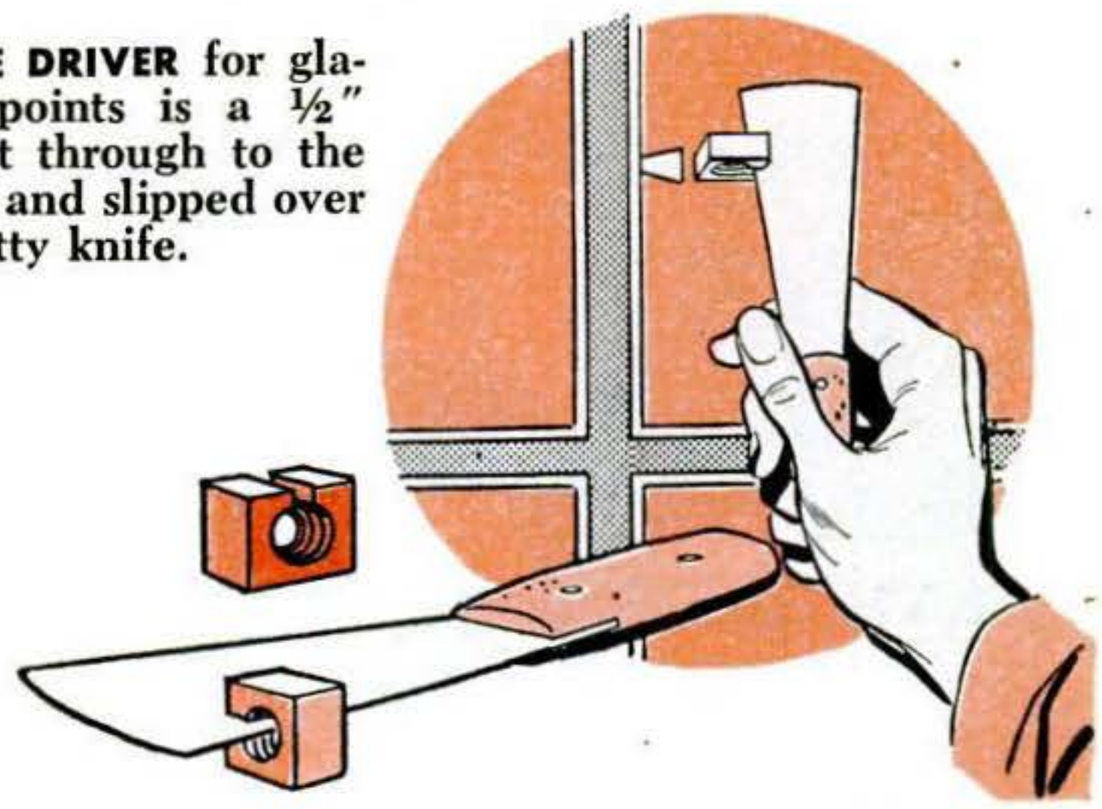
AN AIRY ROOM DIVIDER can be made of four pieces of lumber strung with plastic furniture webbing or clothesline tinted with cold-water dye. Pass the lacing through screw eyes or wooden drapery rings.

ENCLOSING A SINK? If there's a radiator under it, drill holes through one partition to make a towel-drying cabinet beside it.

SAVE THE RUG under baby's chair with a hardboard mat. Round the corners of a ¼" panel, then varnish to seal out stains.



A SAFE DRIVER for glazier's points is a ½" nut cut through to the thread and slipped over the putty knife.



Please turn the page for more home tips

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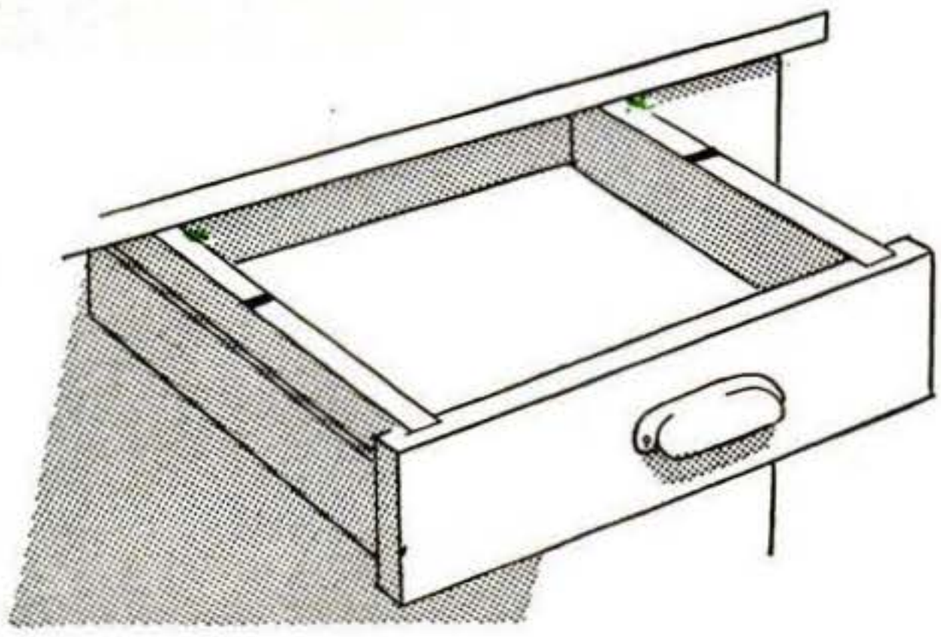
More Home Tips

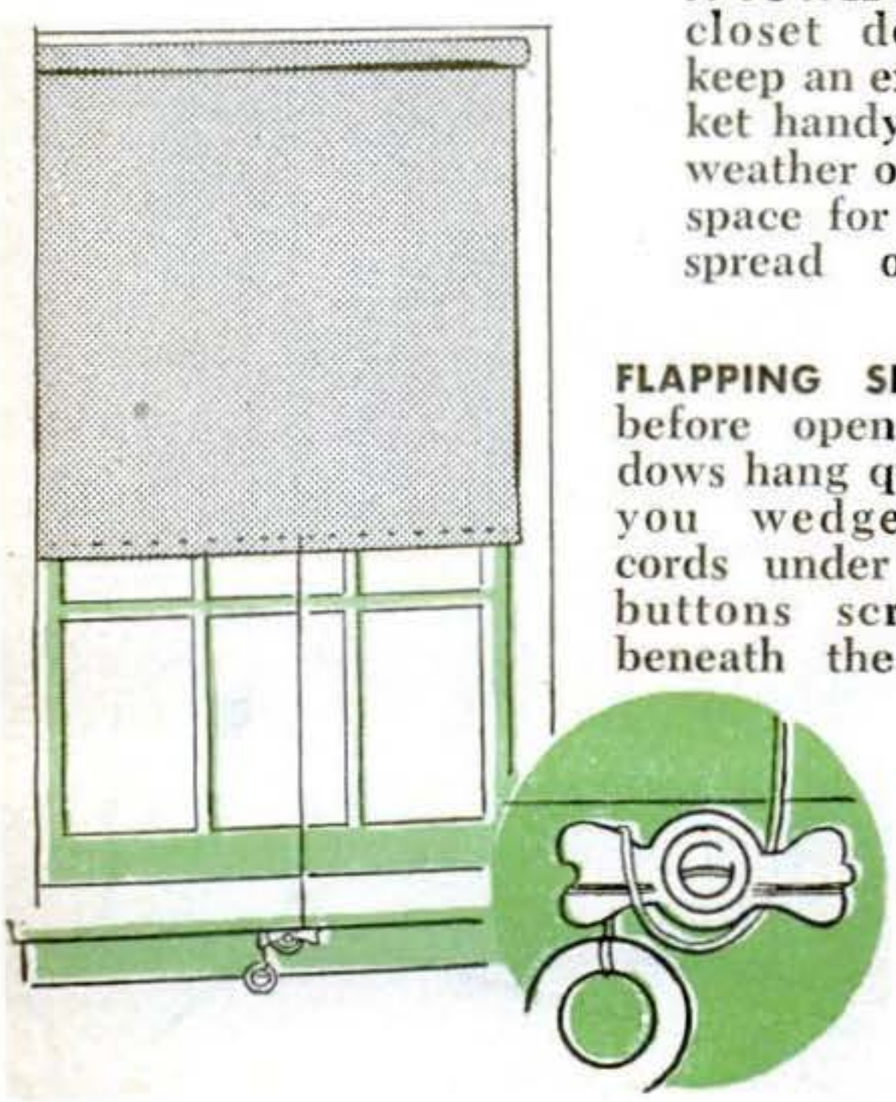
AN OLD SNARE DRUM with the head cut away makes a good waste basket for a boy's room. If the bottom of the drum is too, turn it upside down and leave the snares across the middle to serve as a convenient handle.

DEEP GOUGES in hardwood floors can be filled with composition wood. Build up fill higher than the boards and sand flush when hard.



MARK DRAWERS so you won't pull them out and dump the contents. Put a black line a few inches from the danger zone, a red one just before the vital spot.

A BRIDGE LAMP that has seen its day in the parlor is still handy in the shop. You can move it about to pour down light just where you want it. For close work, screw in a reflector bulb.



A TOWEL BAR on a closet door will keep an extra blanket handy for zero weather or provide space for the bedspread overnight.

FLAPPING SHADES before open windows hang quiet if you wedge the cords under turnbuttons screwed beneath the sills.

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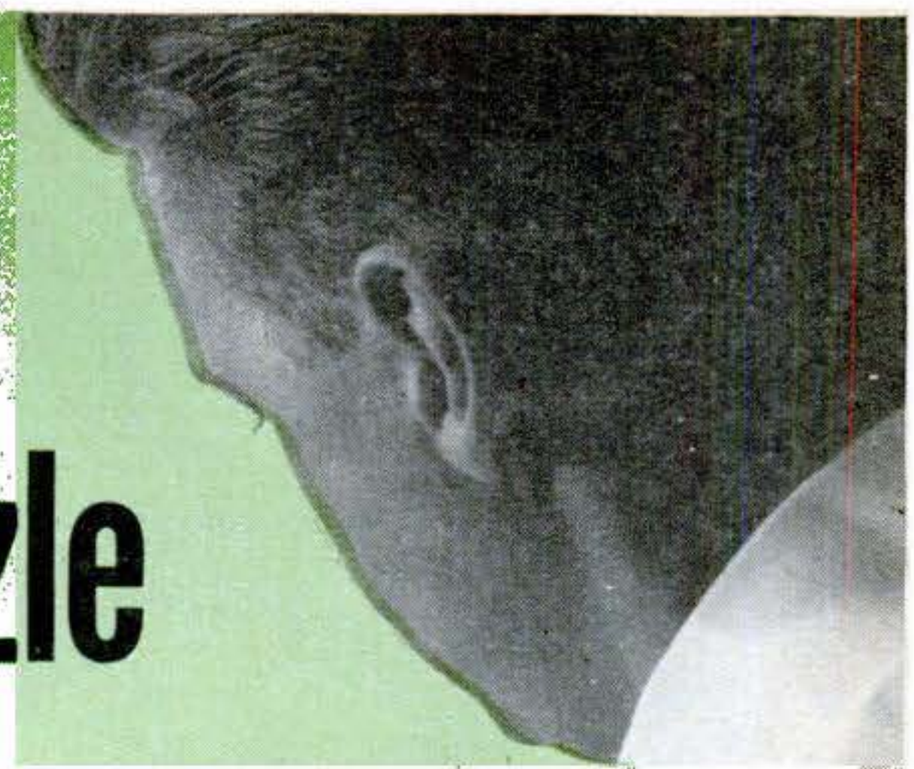
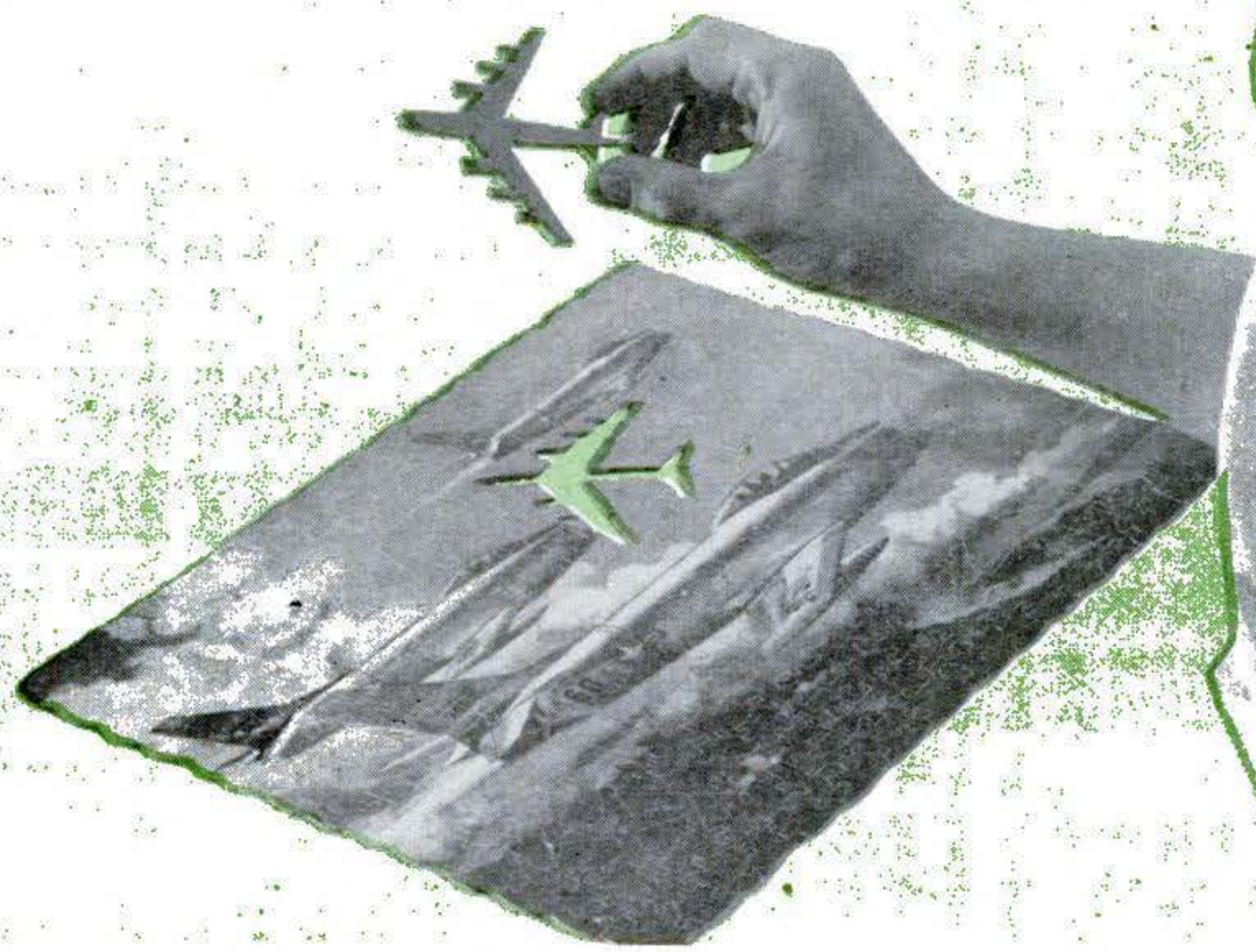
How to Make a Jig-Jet Puzzle





Solving this puzzle will help you identify eight U. S. planes; you can make it with a power scroll saw or a dime-store tool.

By Richard Garland

WHEN the subject of a jigsaw puzzle is jet planes in action, there's a revved-up interest for the junior pilot in your home. Add authentic silhouettes of eight famous U. S. jets, interlocked with the other pieces of that puzzle, and he'll go for it like an Air Force Panther for a MIG.

Making this jig-jet puzzle is a breeze if you have a power scroll saw. But you don't need one. A dime-store jigsaw will do, if your arm and the blades hold out. Either way, use the finest blades you can lay your hands on—those .008″ thick by .028″ wide are just about right.

For the rest, you'll need a good color reproduction of a propless plane (the one shown here came from an industrial calendar), a piece of ⅛″ basswood plywood at least ½″ wider and higher than the picture, a work board, four ⅛″-thick strips of wood to frame the picture while you sand the back, powdered casein glue, a small tube of rubber cement, some 2/0 sandpaper and a rolling pin.

The silhouettes of bombers, attack planes and fighters on page 209 have been made template-size for your convenience. Attached to the face of the puzzle with rubber cement after the picture has been mounted on the bass-

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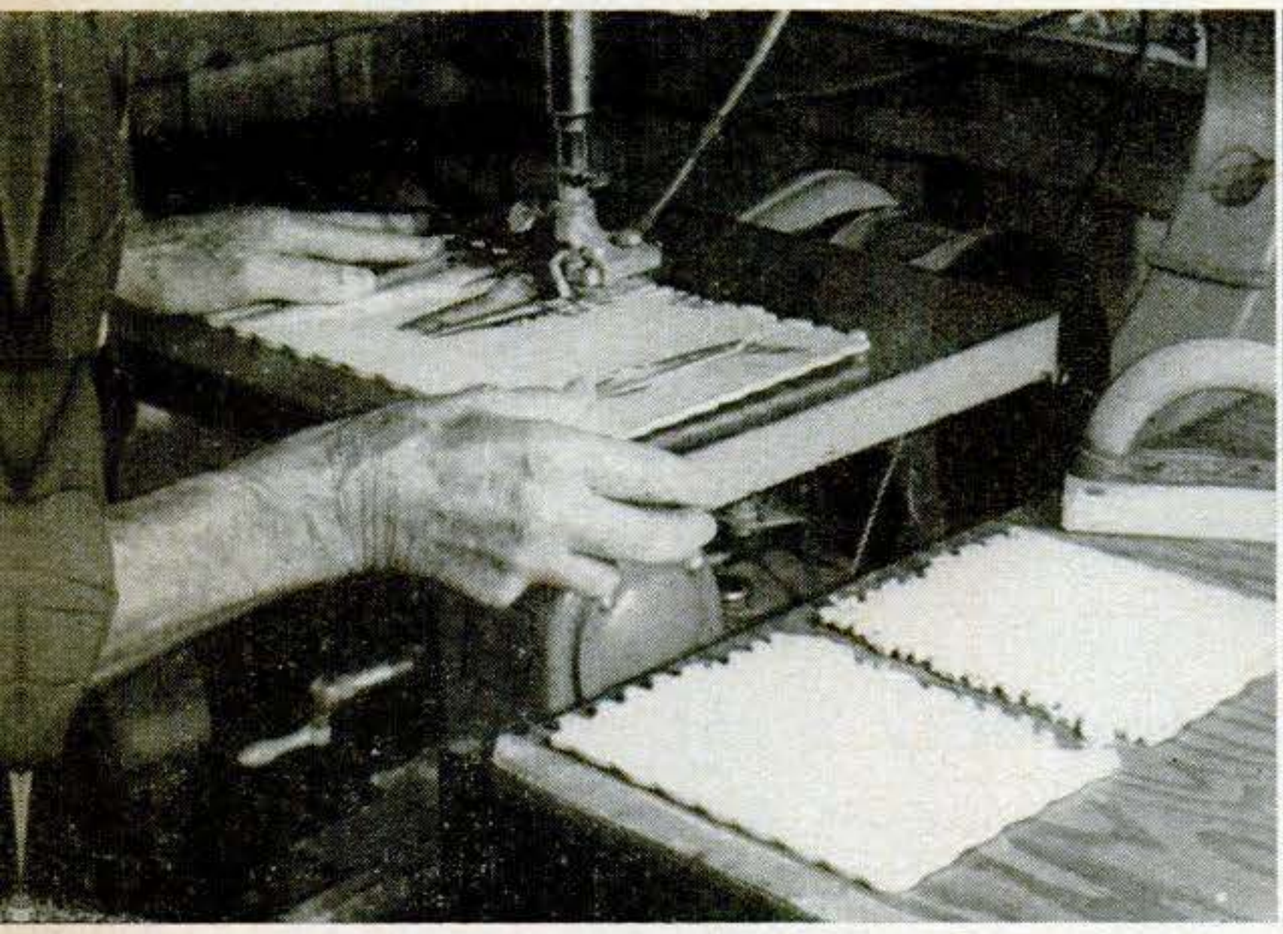
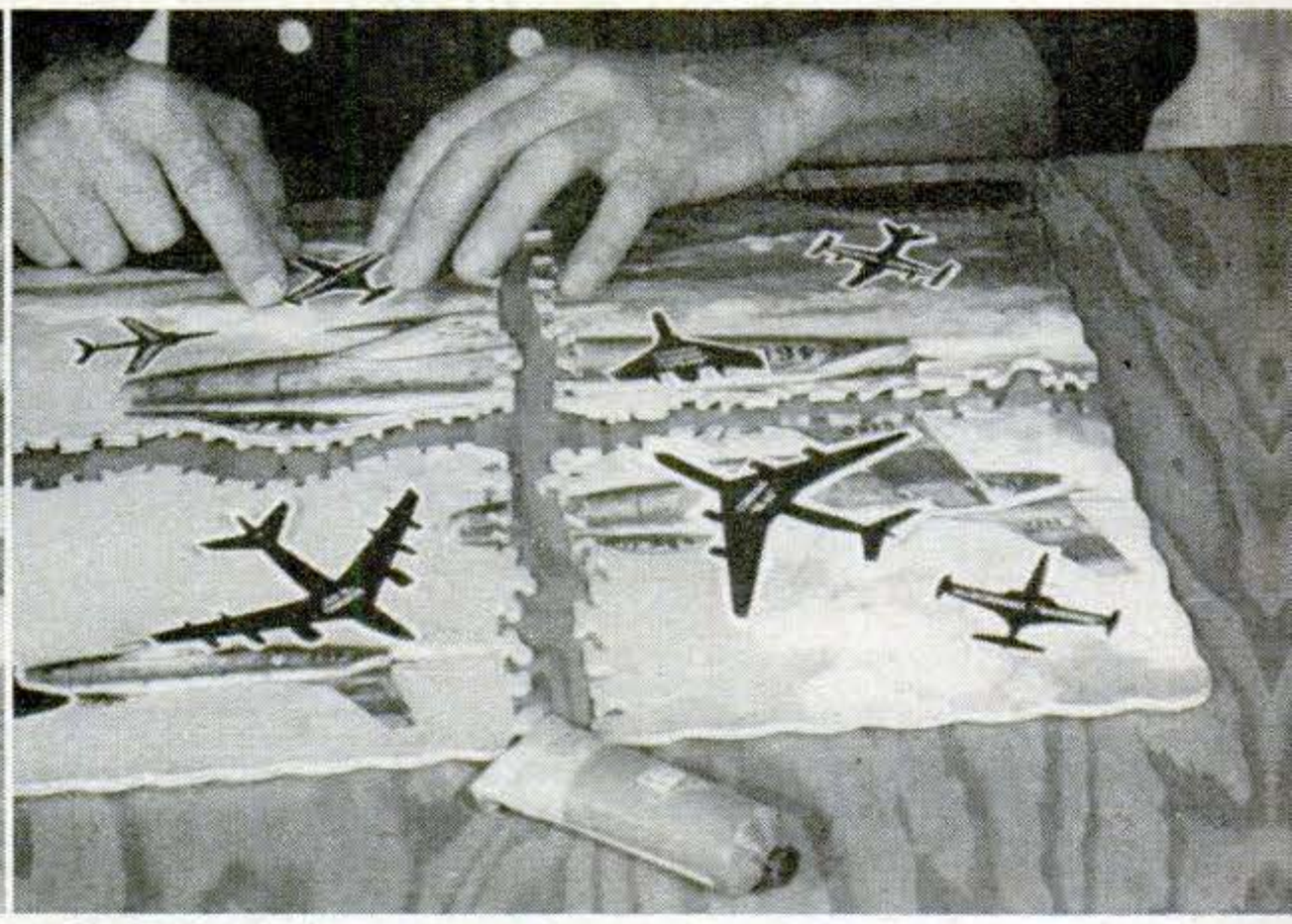
PICTURE IS LAID on glue-painted panel. Roll gently from center outward in all directions, increasing the pressure after the air pockets are out. Weight and let dry overnight.

TO MAKE THE PUZZLE HARDER, cut scalloped margins, keeping the outside edges roughly even with the picture outline. On a power scroll saw, use strong blade tension and low speed.



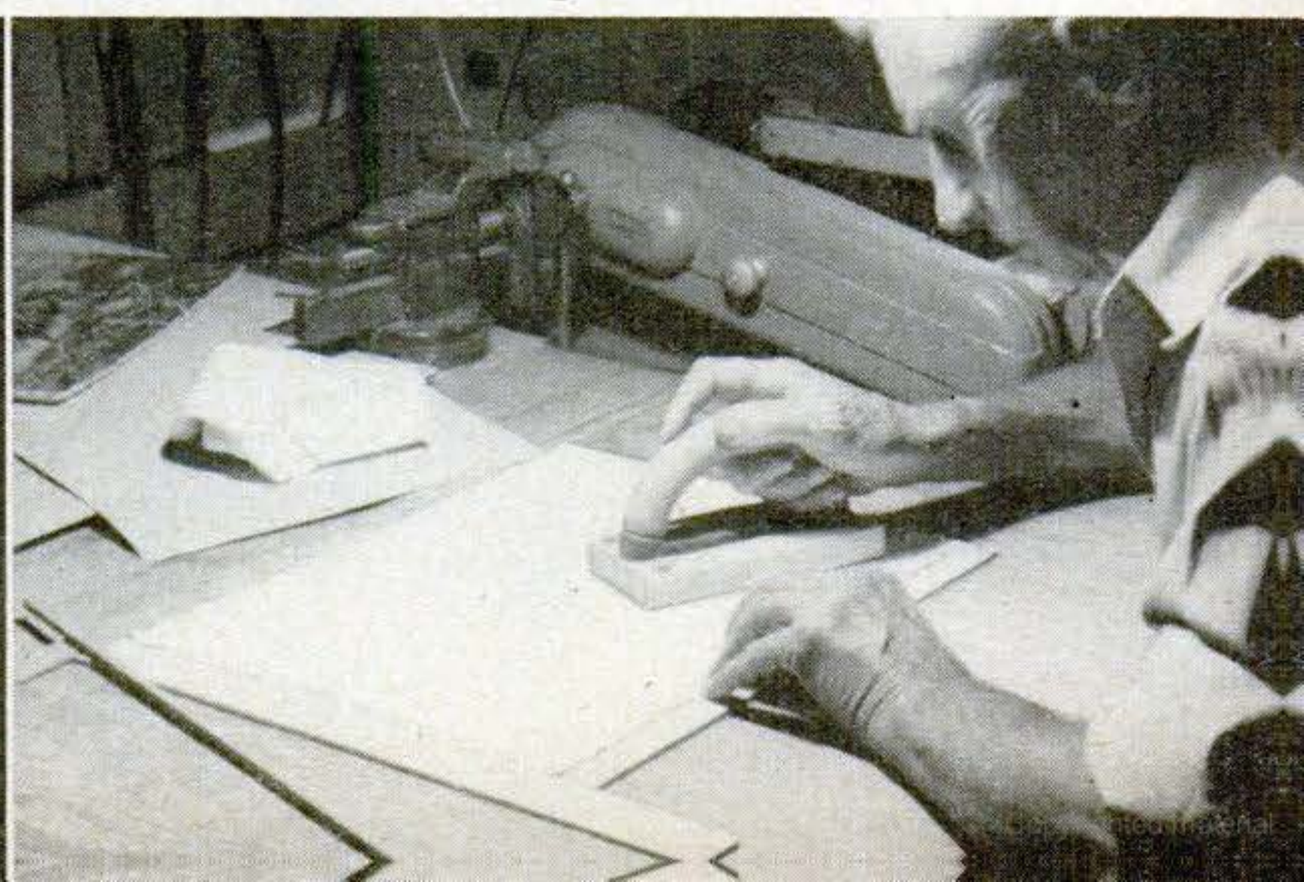
IF PUZZLE IS LARGE, divide the panel into quarters, using curlicue cuts so that adjoining pieces will interlock later. Quarter sections are considerably easier to handle in the saw.

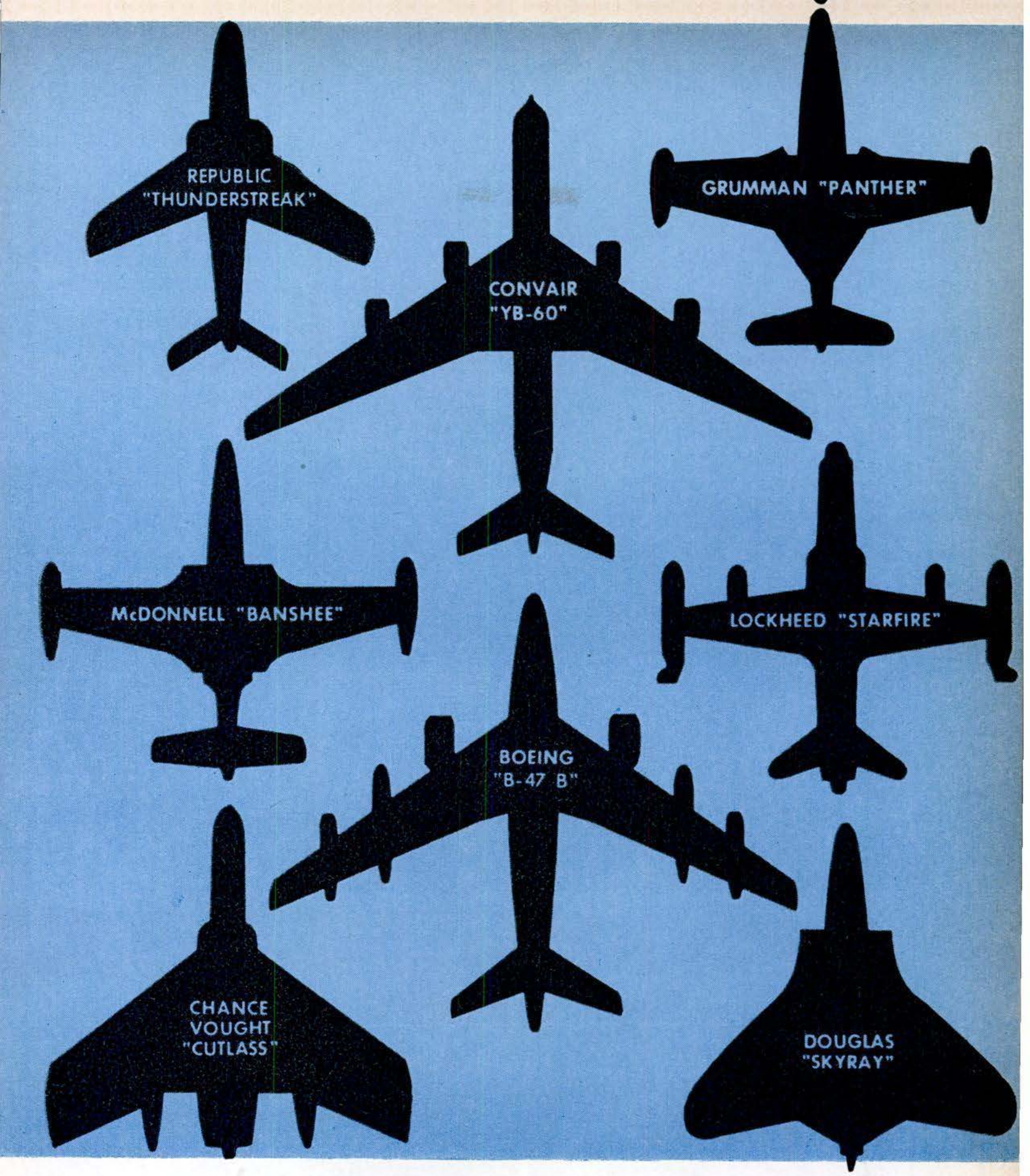


MOUNTING AIRPLANE TEMPLATES comes next. Silhouettes of the eight planes are stuck to the face of the puzzle with rubber cement. They're stripped off after the parts have been cut.

CUT INTERLOCKING PIECES, working to within approximately ½″ of each plane. Then saw up to and around each plane. Finally, cut the framing sections into interlocking parts.

ASSEMBLE PUZZLE ON CARDBOARD, lay the work board over it, and invert. Frame the puzzle tightly with ⅛″ strips bradded to the work board and sand back of puzzle smooth.





Jig-jet template patterns above are full size. Letter the names on backs of plane cutouts.

wood with freshly mixed casein glue, copies of the plane shapes serve as sawing guides. After the plane pieces have been cut, strip off the templates carefully and letter the names of the planes on the corresponding cutouts. That way, your cub pilot will have no trouble identifying the jets until he knows their contours at a glance.

Study the photos on the facing page. They show the six steps used in making the jig-jet puzzle. END

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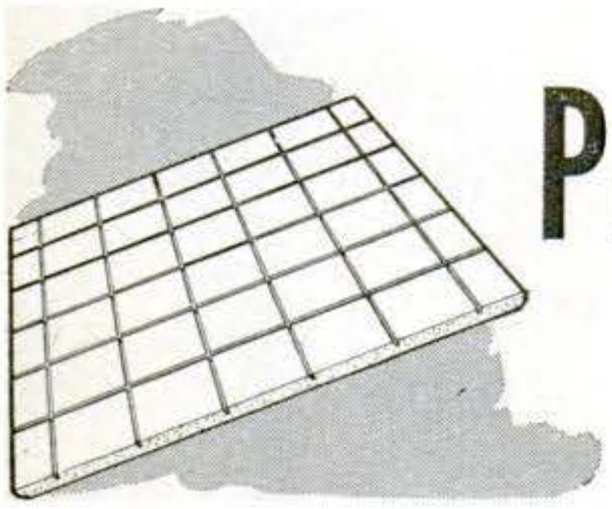
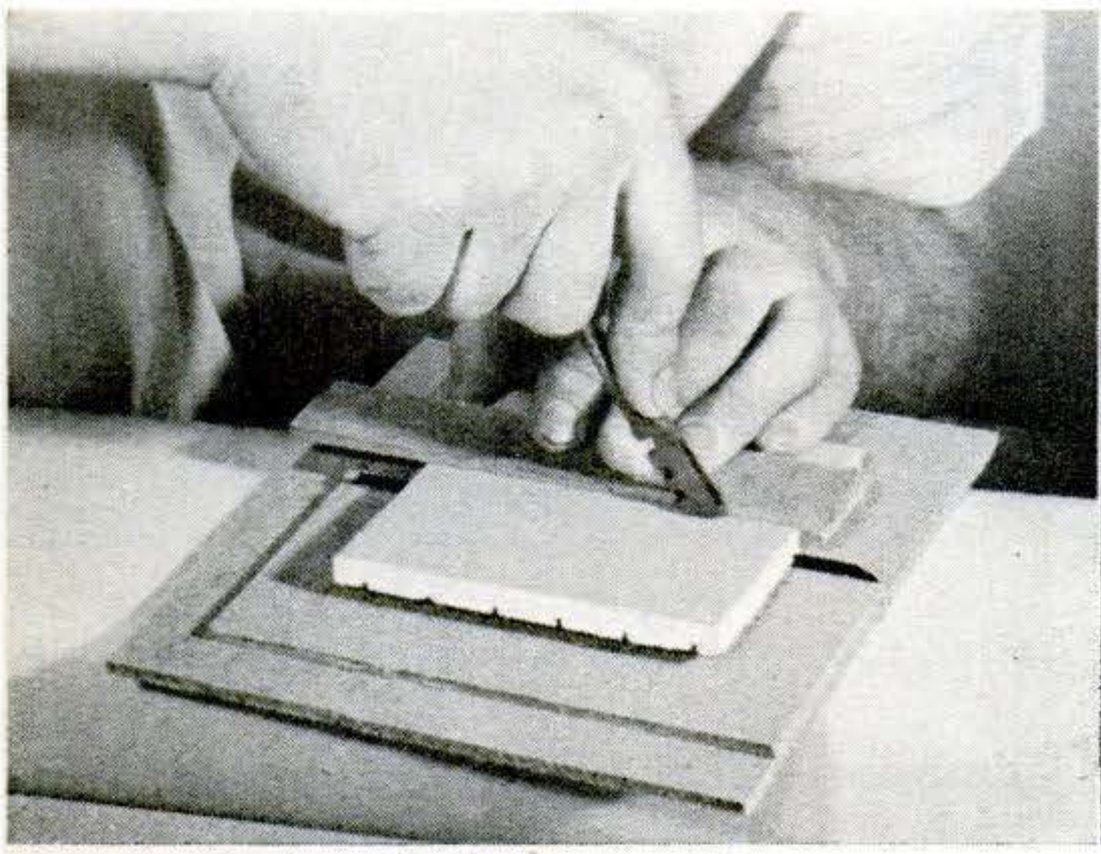
ODD-SIZE OPENINGS like this one for a soap dish are easy to cut with new pre-scored tiles. Tiles are trimmed to desired shape, then simply set in mastic. After every third row, board is placed on top edge and tiles are tapped downward where needed to bring them level.

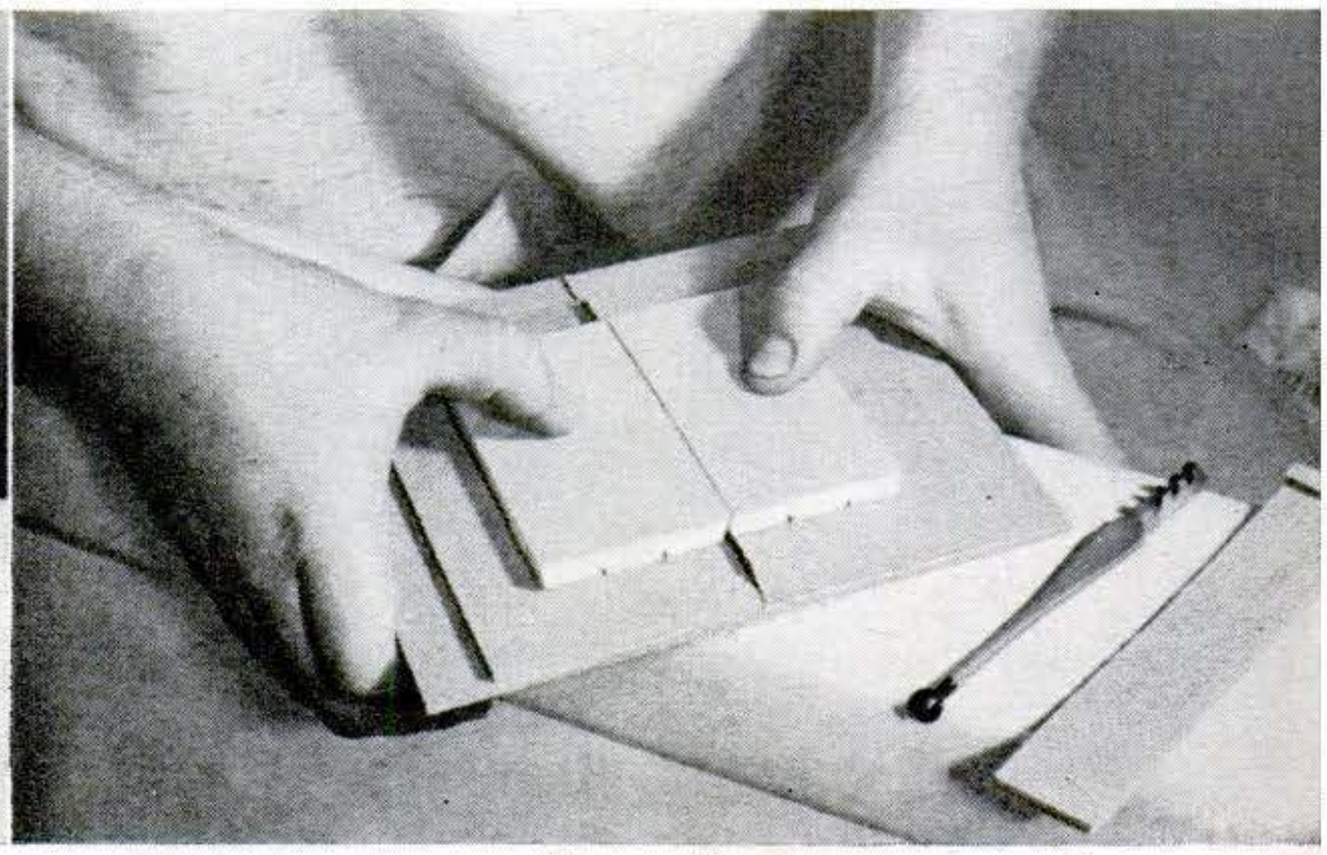


Pre-Scored Tiles Are Easy to Fit

Ready-to-cut kits of ceramic tiles now take the last big headache out of handling the hard spots.



TILE IS CUT by placing appropriate groove on back over raised metal blade in cutting board that comes as part of kit. Face of tile is then scored with an ordinary glass cutter on a line directly above the groove.



TILE BREAKS EASILY when edges are pressed down on either side of blade that acts as fulcrum. Break is clean and even, requiring no further finishing. Note six even divisions above, odd ones along other edge in photo at left.

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IF YOU'VE been putting off that kitchen or bathroom tiling job for fear of all the intricate cutting and fitting you'd have to do, here's good news.

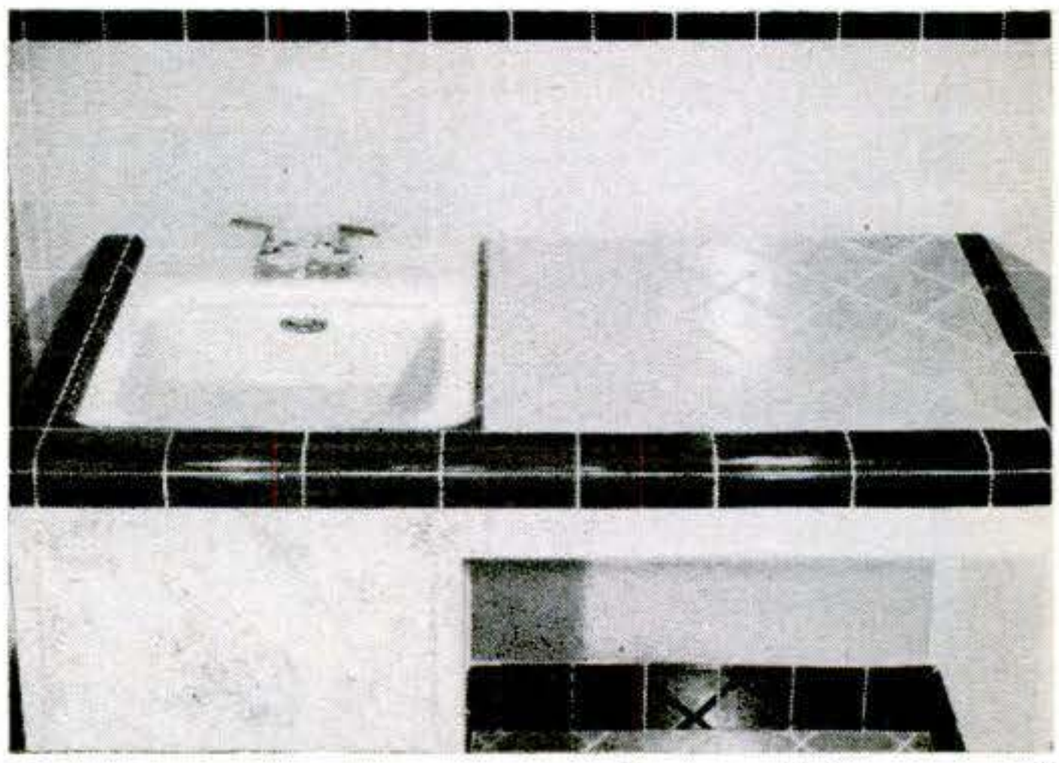
New ceramic tiles that come already scored like a chocolate bar now make it easy to cut any size or shape of tile you need quickly and accurately. The tiles are standard sizes and makes, simply run through a machine that routs grooves in the back. To cut a narrow piece for a filler strip or an L-shaped section for a fixture opening, you just score and break the tile at the appropriate grooves.

The grooves are arranged in an ingenious checkerboard pattern, divided into six ¾″ segments in one direction and five segments in the other direction with a half or ⅜″ segment at each side. By starting at one edge or the other, you can thus cut any size piece in multiples of ⅜″.

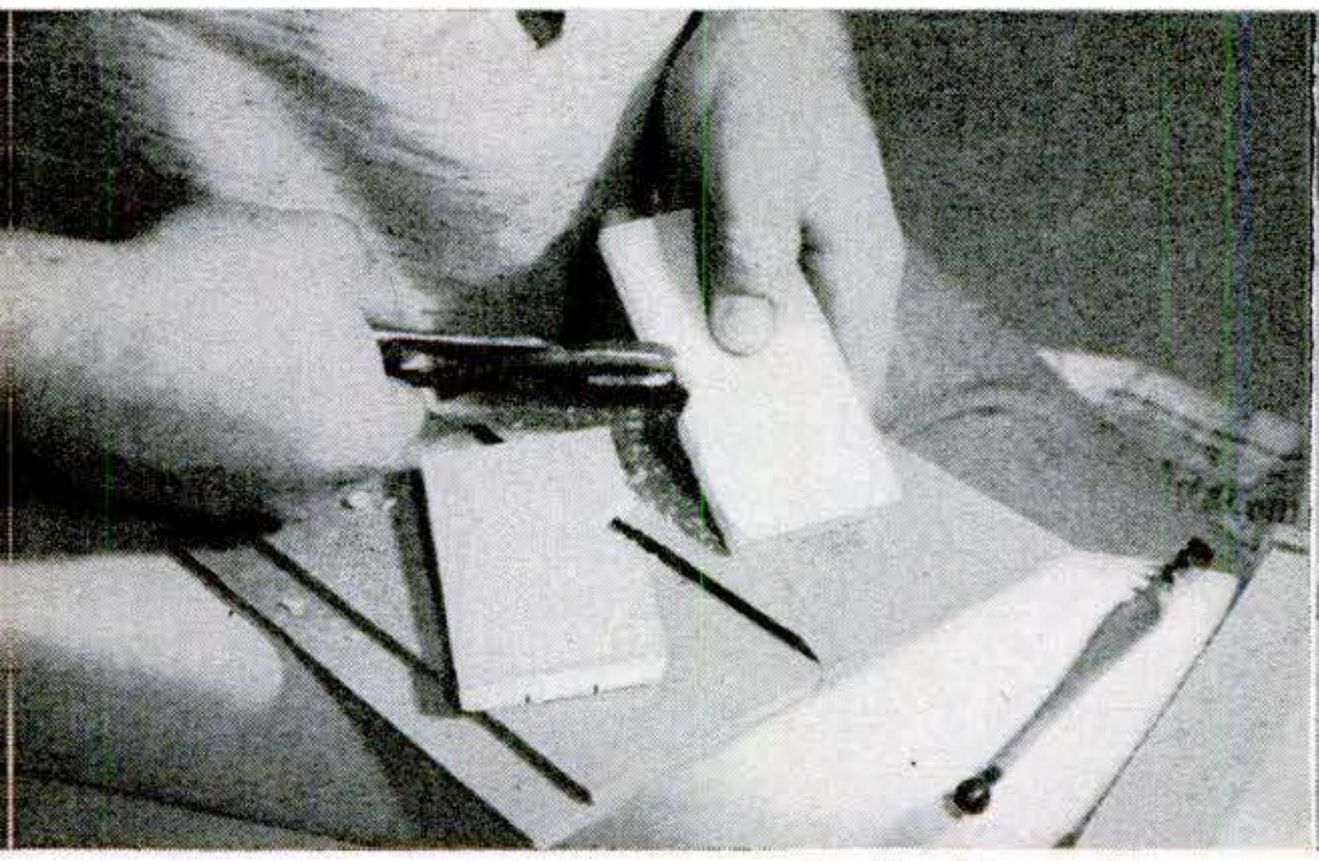
The tiles can be ordered in any standard color and pattern according to the number of square feet to be covered. Along with plain tiles for the large areas will come enough scored tiles to fill in odd-size gaps and fit around pipes and fixtures. Also included in the kit will be trim pieces, adhesive, spacers, grout, and all cutting tools needed to complete the entire job.

The kits are available from the Pre-Score Ceramic Tile Co., 14018 Aurora Ave., Seattle, Wash., or 1559 Pine St., Muskegon, Mich.—*Paul Corey.*

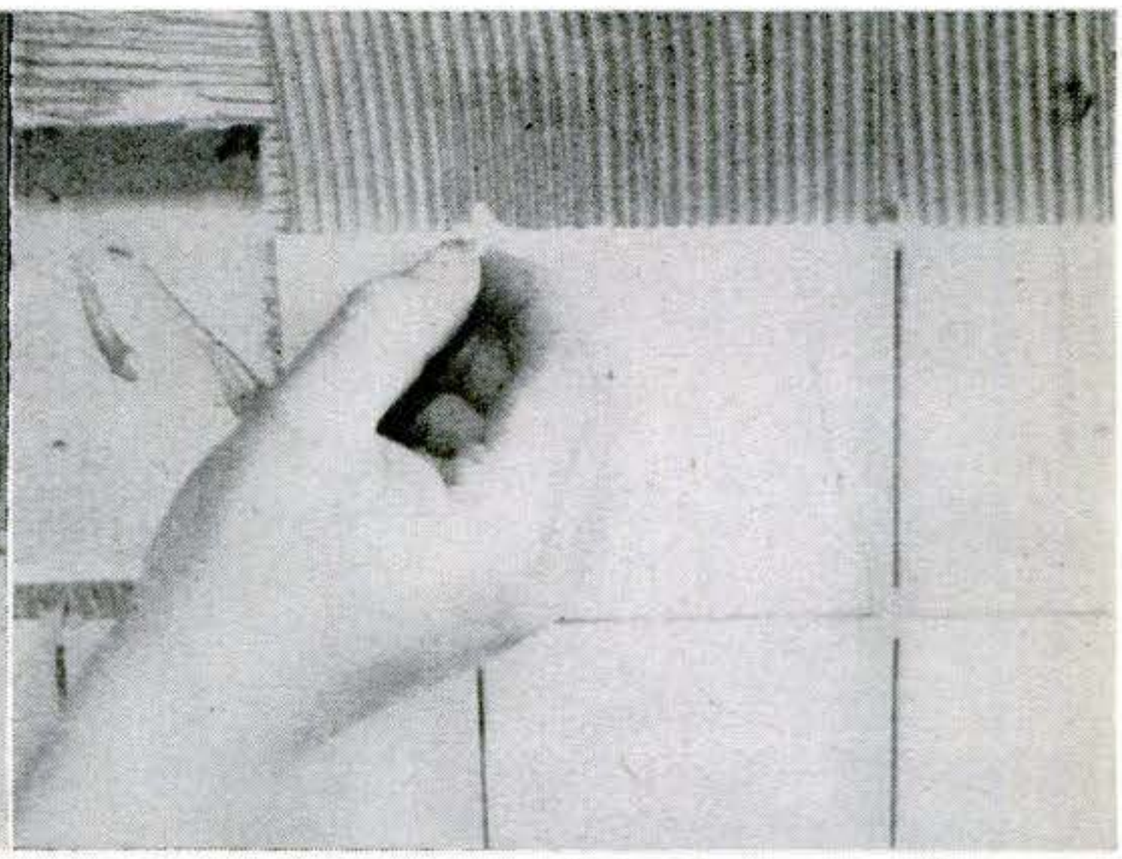
NARROW TILES at corner above tub are typical tiling headaches that require intricate fitting. With pre-scored tiles, entire strip of odd widths can be cut and fitted in a few minutes.



DIAMOND PATTERN, normally a nightmare of tricky fitting, is another job that's easier now. Tiles for floors and counters come with diagonal grooves, cut as easily as straight ones.



TO FIT AROUND PIPE, tile is sliced down the middle where hole is needed. Two half circles are then nibbled out of the tile with pliers. When two halves are cemented around pipe, hairline crack will be practically invisible.



OVER BROAD AREAS, plain tiles are used to save cost of grooved ones. Rubber spacers are inserted at joints to keep them lined up and properly gapped. Final job is filling gaps with grout (see PSM, July '54, p. 182).

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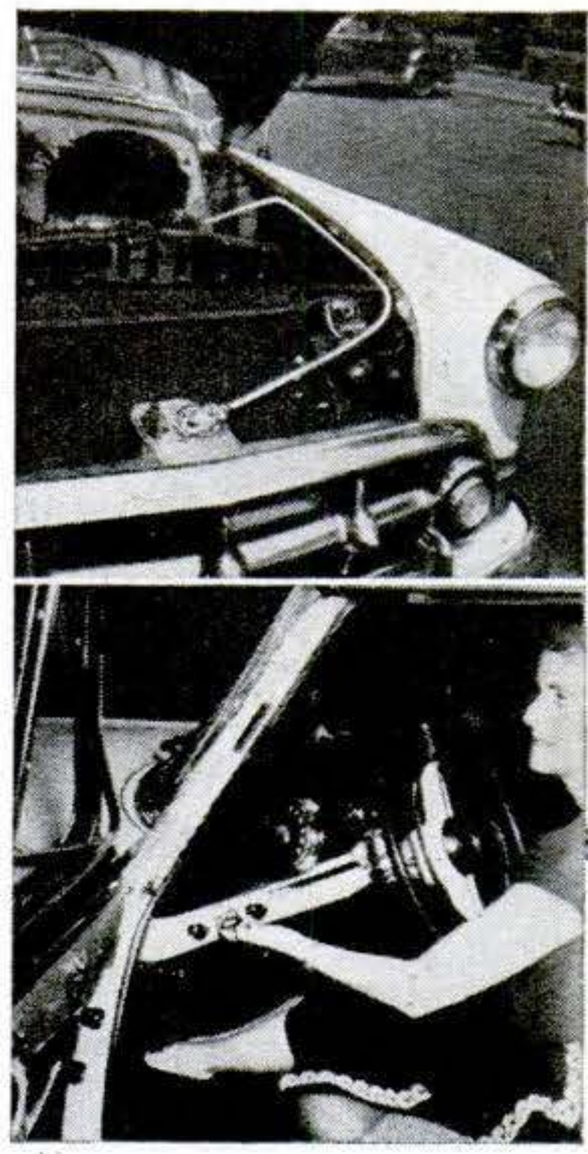
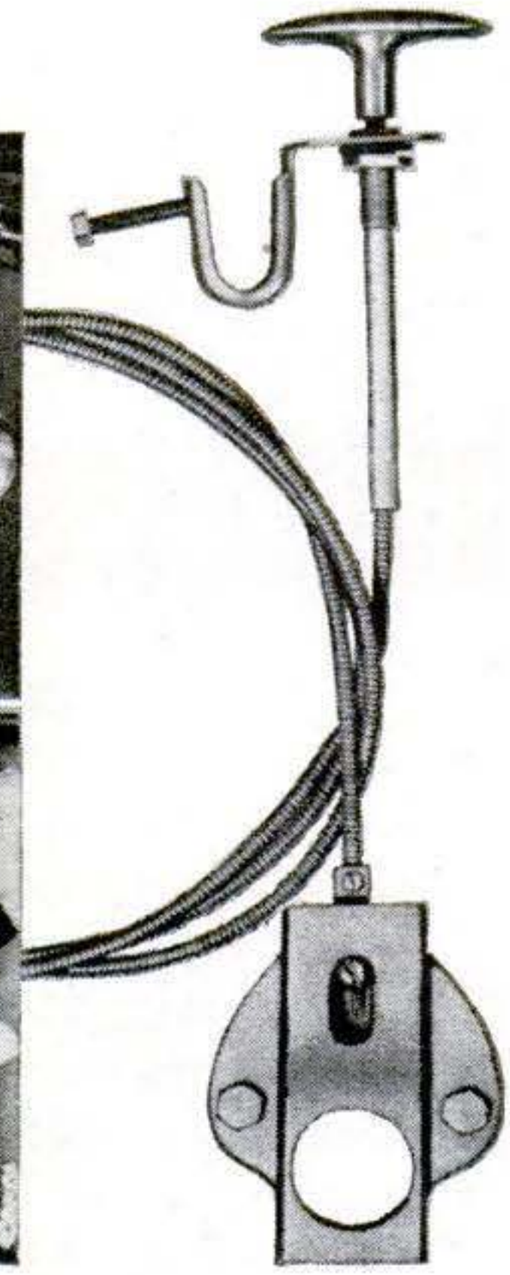
1. Roof Carriers Tailored To Fit. Styled to fit station wagons and many passenger-car models, this luggage carrier is easily installed on a car's roof. A clamp-on type is also available for those who don't desire a permanent installation.

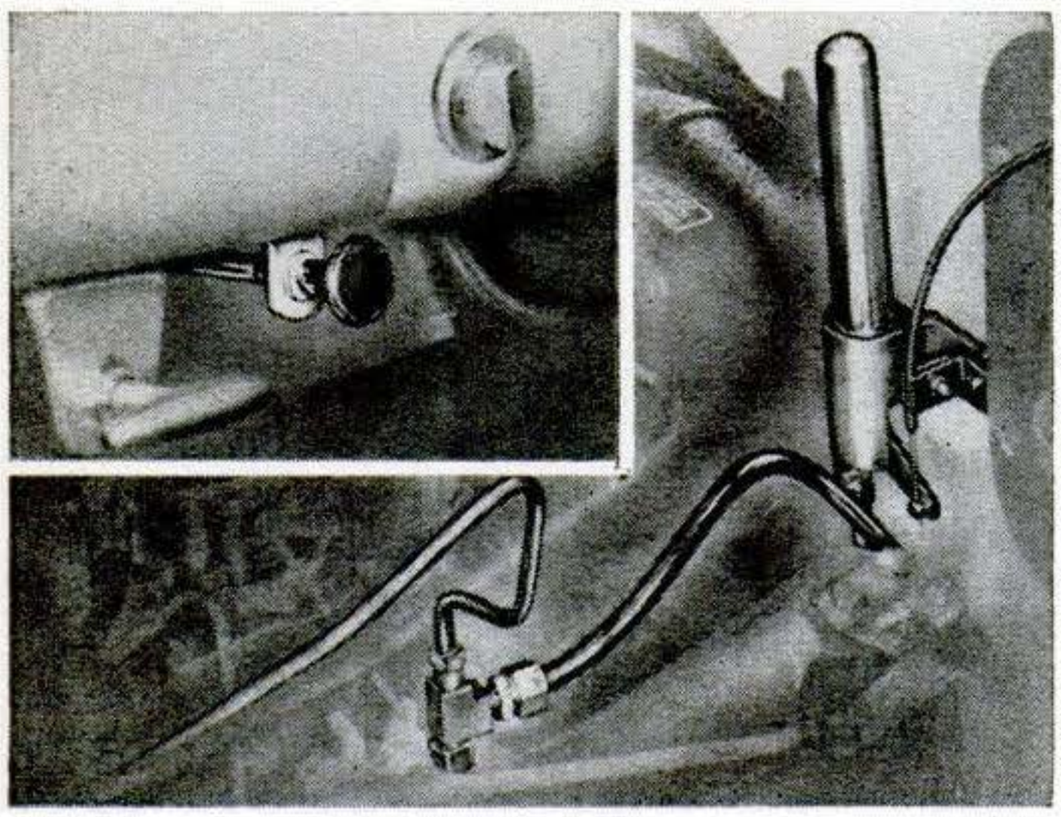
New for Your Car

2. Wiper Handles Snow Overloads. Heavy rain or sticky snow piling up on a windshield won't blind the driver of a car equipped with the new Cobra windshield wiper. A control knob permits shortening the stroke from the normal range to a half stroke in line with driver's vision. Half stroke is too rapid for eye to follow.





3. Hood-Latch Kit Foils Thieves. Safeguard your battery, power-steering unit and other expensive under-the-hood accessories from thieves or vandals by installing an inside-release hood latch in place of the easily-opened outside latch found on many cars. The kit comes with do-it-yourself instructions for easy installation.



4. Primer Speeds Cold Starts. Pull a button on the dashboard and this primer injects a metered charge of special vaporized fuel into the intake manifold to help your engine kick over in cold weather. The device is said to make starting easy in temperatures as low as minus 40°F. The replaceable fuel cartridges are good for about 70 starts.

Further information on these new car products can be obtained from: 1. Canell Station Wagons, 616 Communipaw Ave., Jersey City, N.J.; 2. The Anderson Co., Gary, Ind.; 3. Superior Screw & Mfg. Co., Inc., Chicago 13; 4. Tanra Mfg. Co., Inc., 420 Alden St., Orange, N.J.

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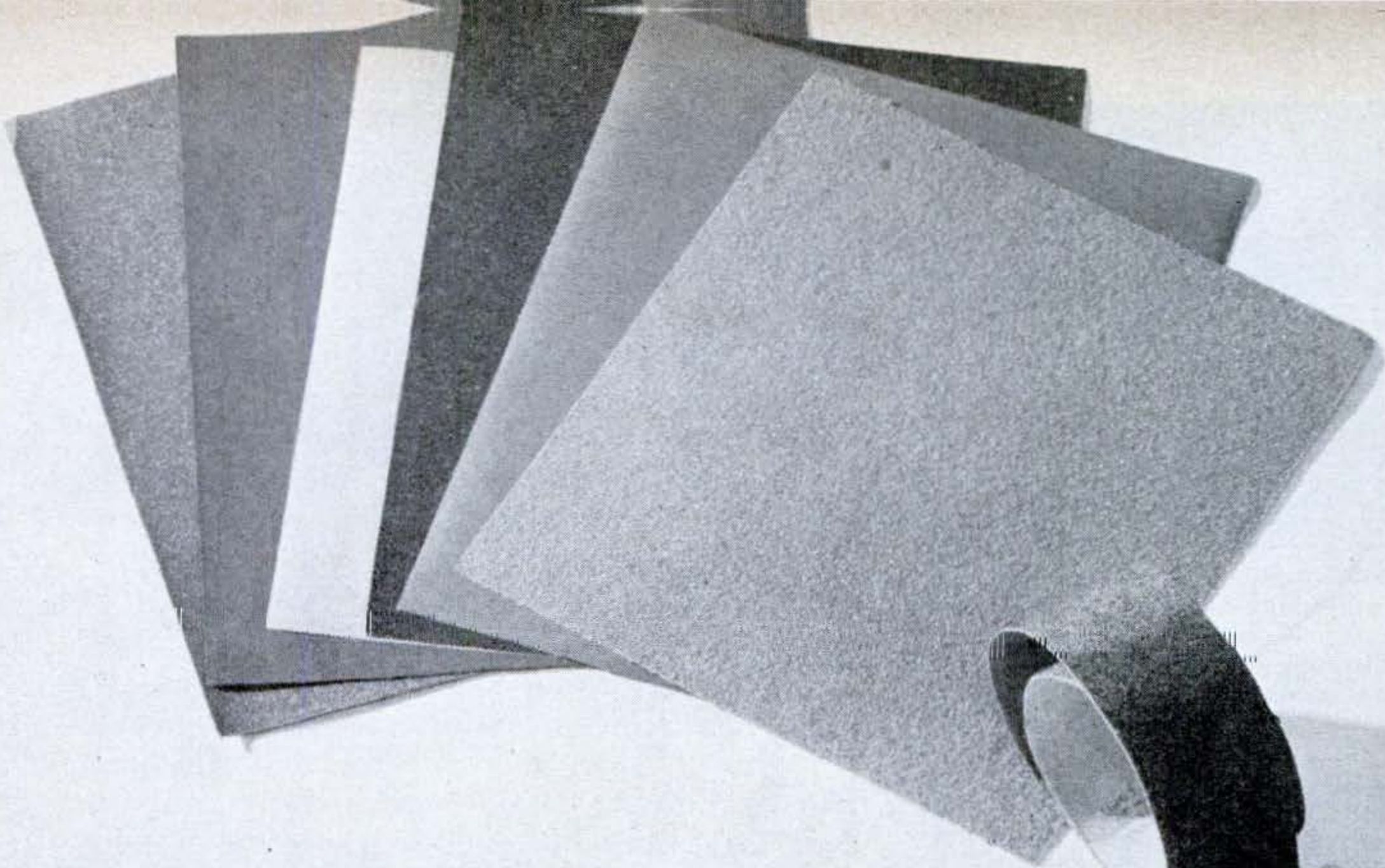


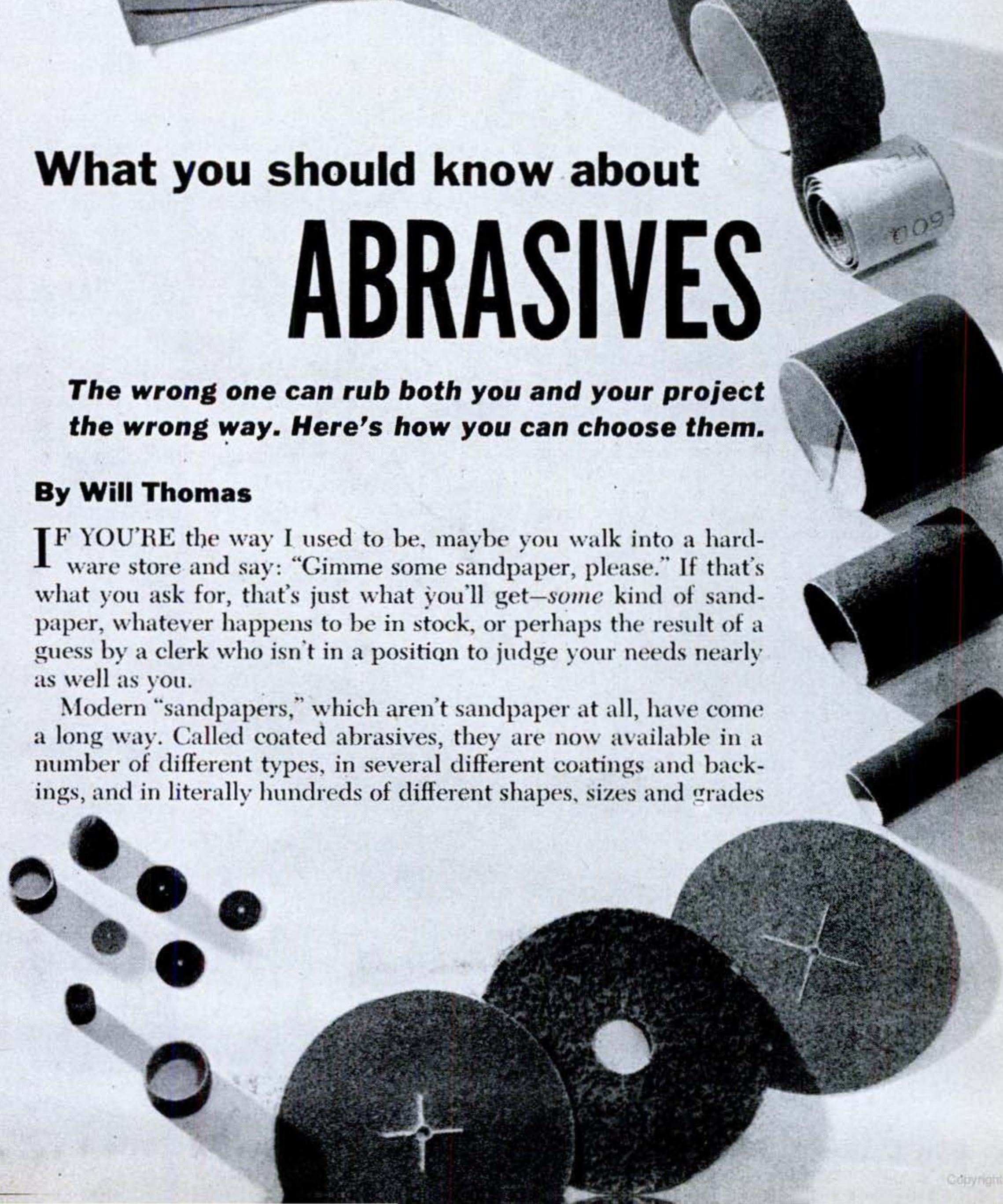
What you should know about ABRASIVES

The wrong one can rub both you and your project the wrong way. Here's how you can choose them.

By Will Thomas

IF YOU'RE the way I used to be, maybe you walk into a hardware store and say: "Gimme some sandpaper, please." If that's what you ask for, that's just what you'll get—*some* kind of sandpaper, whatever happens to be in stock, or perhaps the result of a guess by a clerk who isn't in a position to judge your needs nearly as well as you.

Modern "sandpapers," which aren't sandpaper at all, have come a long way. Called coated abrasives, they are now available in a number of different types, in several different coatings and backings, and in literally hundreds of different shapes, sizes and grades



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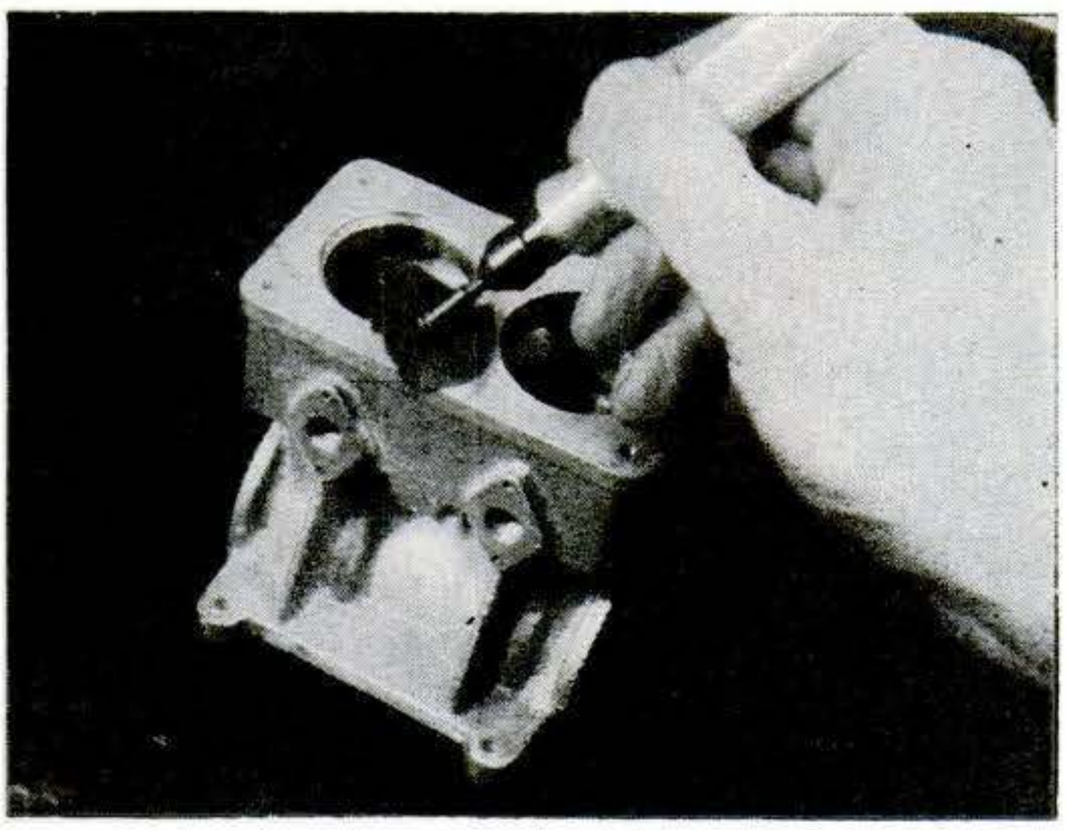
ABRASIVE DISK replaces saw blade in this simple sanding-table setup. Disk is cemented to metal or hardboard backing plate and bolted to shaft in same way as blade. Use of miter gauge permits accurate sanding at any angle. Here ends of aluminum tubing are squared.



TINY DISKS, slotted so they can reach irregular surfaces, make short work of cleaning up castings for small engines and other modelwork. Disks can be used in flexible shafts, as here, or chucked in electric drills.

of grit. Your chance of hitting the right one by buy-and-try? About one in a hundred. So you wind up with a near hit that's really a big miss.

In many projects, sandpaper is the last and most important tool to touch your handiwork. It's responsible for the special sheen and feel of a fine finish, the magic touch that turns wood to velvet or a flash-flecked casting into a glittering metallic jewel. In other projects, sandpaper may be the basic tool that does the bruising job of grinding and shaping your work into the form you want.

In either case, you can't afford to go wrong, and once you know what abrasives there are and what each one is good for, there's no need to go wrong. Your work will go faster, look better and cost less when the right sandpaper is on the job.

There are five things to consider when you choose a sandpaper: abrasive, grit size, type of coating, backing and form. This may sound like a lot to learn, but if you take them one at a time, you'll find them easy to keep track of.

Types of abrasives. Here you have five different kinds to choose from. Flint, the old-timer, is a soft, yellowish natural quartz mineral that's actually the closest that sandpaper ever came to looking like sandpaper. Now outclassed by more efficient abrasives, it has about as much value as a second-hand Kleenex; but luckily it is almost as cheap and just as disposable, and so has some use in certain jobs requiring quantity over quality.

Emery, another natural mineral, is a gray-colored mixture of iron oxide and corundum that was formerly used for finishing metal. Now displaced by synthetic abrasives, it is used chiefly today only for polishing.

Garnet is the hardest of natural abrasives, in purer forms a rubylike gem stone that many a guy has placed on many a gal's finger in the name of something other than sandpaper. It cuts ice in other ways, too. Rated at 6.5 to 7.5 on the Moh Hardness Scale, where the diamond rates 10, it is in many shops the basic paper for finishing wood.

Aluminum oxide is a synthetic abrasive made from bauxite, coke, and iron filings in an electric furnace. It is very hard but also very tough, and is fast becoming the most widely used all-around paper. It is gray-brown in color.

Silicon carbide, another synthetic made of coke and sand, is the hardest of all abrasives, rated at 9.5 to 9.9 on the Moh scale. But it is also very brittle, and can be used only in certain applications. It appears dark gray to black on sheets.

Crocus cloth might also be included, though its coating is iron oxide and not a true abrasive. It is used only for fine metal polishing and is red in color.

The chart on page 215 will help you

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choose the right abrasive for a number of typical jobs.

What grit size to use? Modern abrasives come in grits so fine that they feel like baby powder, and so coarse that they seem like cobblestones. For most jobs, the sizes you'll want will lie somewhere in between.

Identifying different grades of abrasive is like trying to follow a bunch of football players—you can't tell either of them apart without a program.

What happened was that the old grading system, using arbitrary numbers from 4, 3½ and so on to 10/0, has proved inadequate for the wide range of modern

How You Can Choose the Right Abrasive for Your Job

SELECTING an abrasive is simpler than it may look: You use the one that cuts fastest and most efficiently. The chart below will help you pick the best for a number of typical jobs.

Where two abrasives are given for the same job, the experts themselves differ on the choice. Some wood finishers prefer garnet paper, for instance, while others like aluminum oxide. For all practical purposes, either will work well, so use whichever you have.

To identify abrasives, color may not always be reliable. This varies from batch to batch and also according to the adhesive used. Flint, emery and garnet papers are so marked on the back, but the synthetic abrasives may carry only trade names. Here are some of the trade names used. For *aluminum oxide:* Adalox, Luminite, Luminox, Metalite, New Process, Production, Three-M-ite, Garalum, Alundum, Jewelox, Aloxite. For *silicon carbide:* Tri-M-ite, Durite, Crystolon, Jewelite, Amunite, Carborundum.

	ALUMINUM OXIDE	SILICON CARBIDE	GARNET	EMERY	FLINT
CERAMICS *(to shape and sand)*		✓			
FLOORS *(to sand)*		✓			
GEMS *(to cut and shape)*		✓			
GLASS *(to shape and sand)*		✓			
LEATHER *(to shape and sand)*	✓	✓			
METALS *(hard, to shape and sand)*	✓				
METALS *(soft, to shape and sand)*	✓	✓			
METALS *(soft, to polish)*				✓	
METALS *(hard, to polish))*	✓			✓	
METALS *(to remove rust and dirt)*	✓			✓	
PAINT *(and similar finishes, to smooth)*	✓	✓			
PAINT *(old, to remove)*					✓
PLASTICS *(to shape and sand)*		✓			
WOOD *(to hand-shape and sand)*			✓		
WOOD *(to power-shape and sand)*	✓		✓		
TOOLS *(to sharpen)*	✓				

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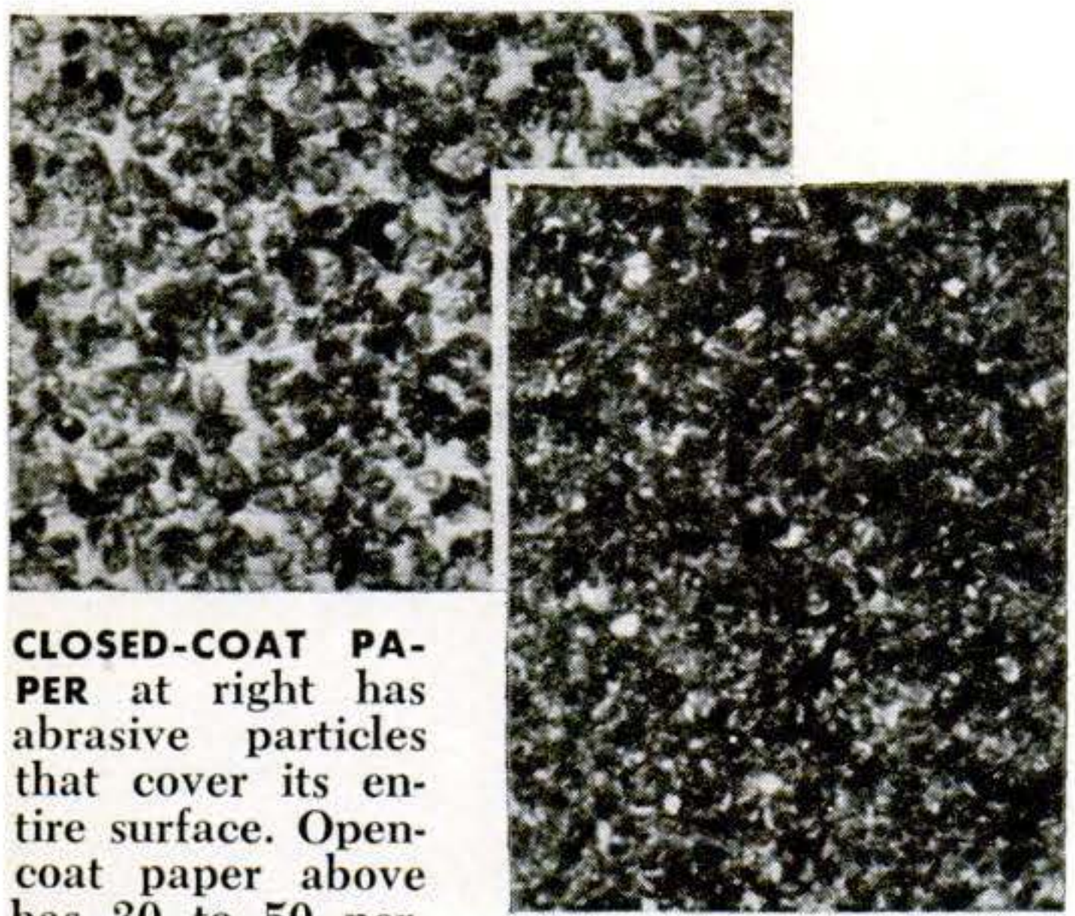
KING OF THE SANDERS, this combination disk and belt rig will handle most jobs that can be done in stationary machines. Belt can be used flexibly on contours or backed up by plate for flat work. Rollers serve as drum sanders; round plate in background is disk sander.



CLOSED-COAT PAPER at right has abrasive particles that cover its entire surface. Open-coat paper above has 30 to 50 percent fewer particles, cuts more slowly, but is less likely to clog because open spaces let chips fall out. Use closed coat for fast cutting unless it loads, then switch to open.

abrasives, and is gradually being replaced.

The newer system is based on the mesh sizes that the grains must pass through, and ranges from 12 to 600. Some papers are marked with the old numbers, some with the new, and some with both. The data card on page 217 shows the corresponding numbers in all classifications from very fine to very coarse.

Use abrasives in combination. Because abrasives must do a wide range of jobs, from the original shaping to final polishing, it usually takes a number of different grit sizes, used in stages, to complete a single project. The first may remove dents, for instance, the second the scratches left by the first, the third the scratches left by the second, and so on until the desired smoothness is obtained.

In finishing wood, you might use 60 grit for coarse sanding, 80 for smoothing, and 120 for finishing. You might use the same grits for metal, though in most cases you would probably start finer, say with 80, and finish with 180 or 220 grit.

In no case should you start with a grit that's either too coarse or too fine, for you'll waste time with either. The best bet, when in doubt, is to begin with a medium grit, then switch to coarser if the work goes too slowly, or to finer if the coarse cuts too rough or too fast.

Smoothing paints or other fine finishes, on wood or metal, will require very fine grits. The first coat might be smoothed with 220 grit, the second coat with 320 and the third with 400. You may want to use some light oil with the last rubbing.

On the other extreme is floor sanding, where 30 grit may be used for removing the old finish, 40 or 50 for smoothing and 80 or 100 for final sanding.

Coated abrasives can also be used to sharpen tools. For average sharpening, the grit sizes will be about the same as the grinding wheels used for the same purpose, say 40 or 60 grit for rough sharpening and 100 or 120 for finishing.

For work on specialized materials such as glass, marble and gems, it's best to consult a textbook on the proper grits for each particular substance. Any guess here would be a bad one.

Pick the right coating. Many people don't realize that abrasive papers come in two types of coatings, one called a closed coat and the other an open coat.

Closed-coat papers have tightly packed abrasive grains that cover their entire surface, while the grains on open-coat papers cover only 50 to 70 percent

of the surface, leaving open spaces between them.

The closed coat cuts faster because of the greater number of abrasive grains, but is also more likely to become clogged —the experts say loaded—when used on soft materials that jam in between the grains. The open coat, which lets the particles fall out, should be used on soft or gummy woods, paint and other finishes, and on some soft metals and plastics. The one exception is in removing old paint, where closed-coat flint paper, while it clogs quickly, will cut fast and can be discarded readily.

What backing to use? The backing to which the abrasive grains are glued may be paper, cloth, a cloth-paper combination, fiber or a fiber-cloth combination. For home-shop use, though, you'll be mainly concerned with paper and cloth. The fiber and combination backings are used mostly in industrial machines.

Paper is cheapest, so use it wherever it will stand up. But if it cracks and tears quickly, you should be using either cloth or a heavier-weight paper. Paper backing comes in four weights: "A," lightest and most pliable, is used for light hand-sanding on shaped work where flexibility is necessary. "C" and "D" (that's right, there's no "B" weight in use) are stronger and stiffer and are used for hand- and light machine-sanding. Woodworkers call these weights cabinet papers. "E" is the strongest, used mostly for industrial drum- and belt-sanding. Home-shop belts and drums are cloth-backed.

EVEN HARD STEEL is cut with abrasive paper. This rough-forged knife blade is quickly brought to shape on a disk cemented to a rubber-faced wheel, without center hole, that screws onto the grinding-wheel spindle.

In cloth backings, "finishing" is a very light weight used for contour sanding in industrial machines. "J," the lighter of the two commonly available cloth backings, is used for finishing shaped work. "X" is heavier and stronger and is used for flat or shaped work in power tools.

[Continued on page 250]

ABRASIVES (GRIT SIZES)

Comparative Grit Sizes for Coated Abrasives			
Garnet Aluminum Oxide Silicon Carbide	Emery	Flint	
Very Fine	600		
	500		
	400 (10/0)		
	360		
	320 (9/0)		
	280 (8/0)		
	240 (7/0)		
	220 (6/0)		
Fine	180 (5/0)	3/0	Extra Fine
	150 (4/0)	2/0	
	120 (3/0)		
Medium	100 (2/0)	0	Fine
	80 (0)	½	
		1	Medium
	60 (½)	1½	
Coarse	50 (1)	2	
	40 (1½)	2½	Coarse
	36 (2)		
Very Coarse	30 (2½)	3	Ex. Coarse
	24 (3)		
	20 (3½)		
	16 (4)		
	12		

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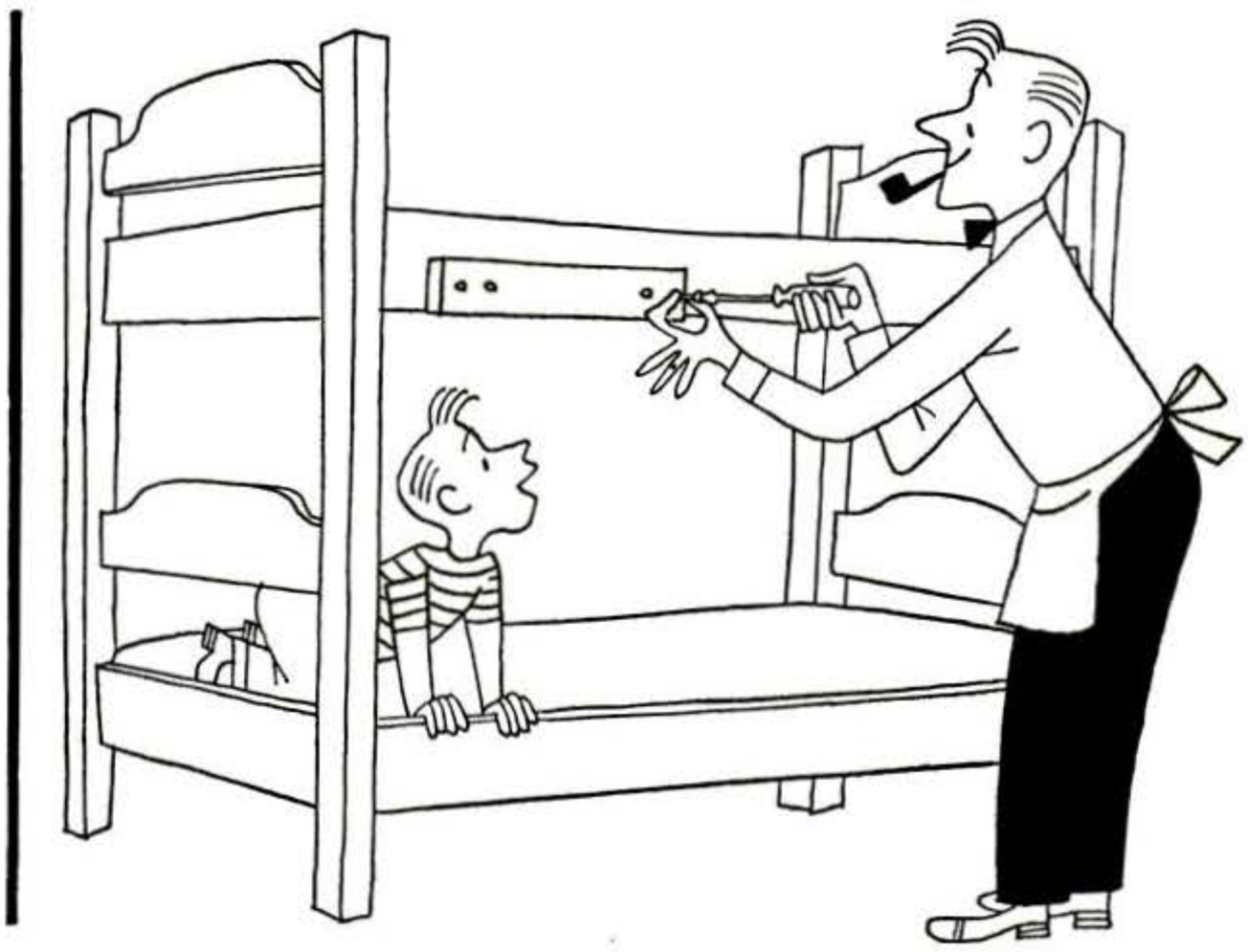
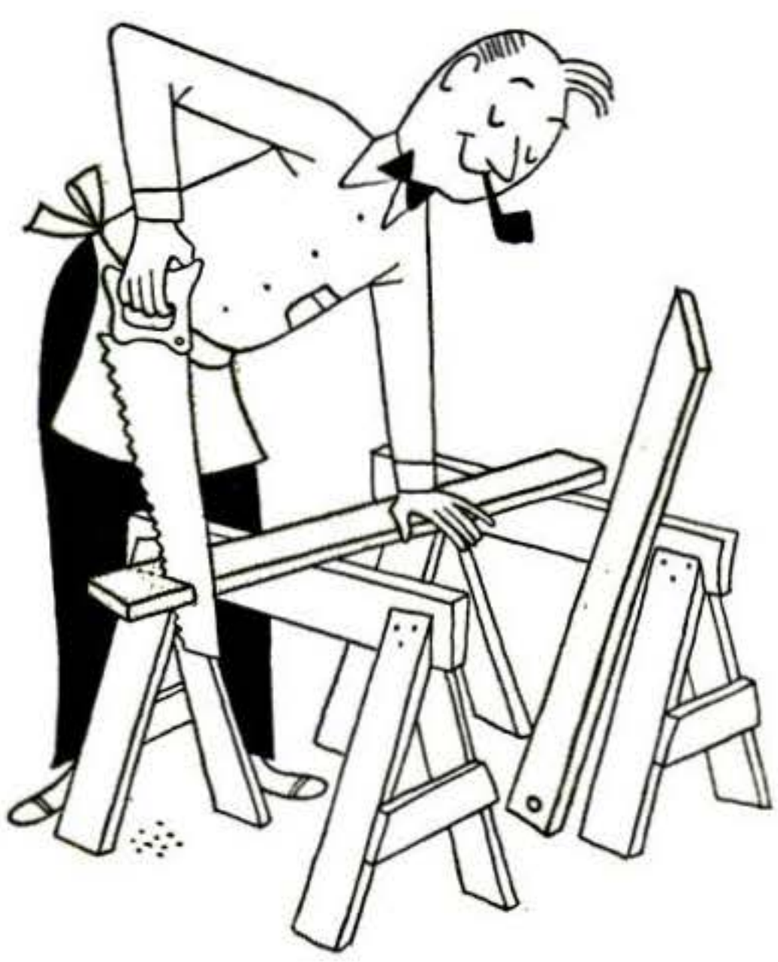
By Roy Doty and Sheldon Gallager

Wordless Workshop





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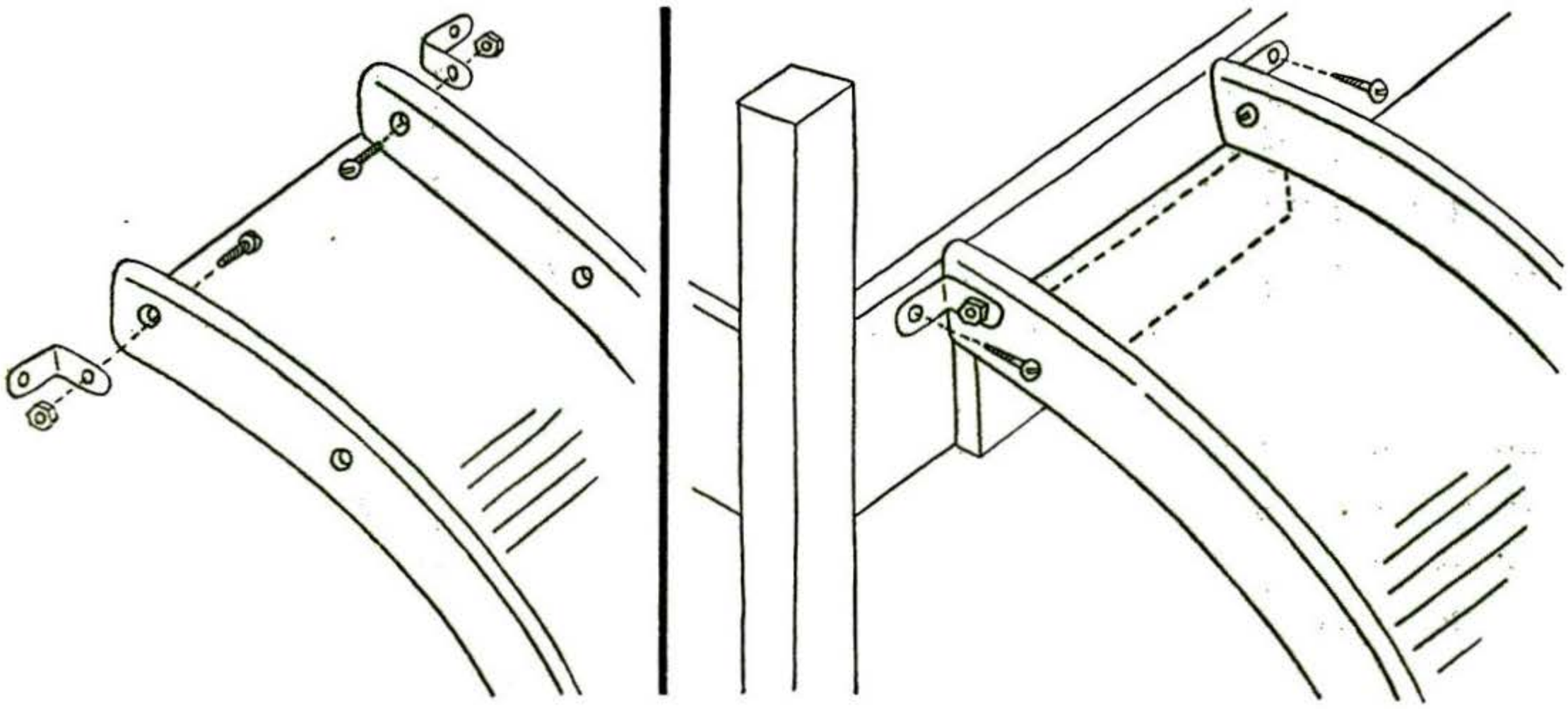

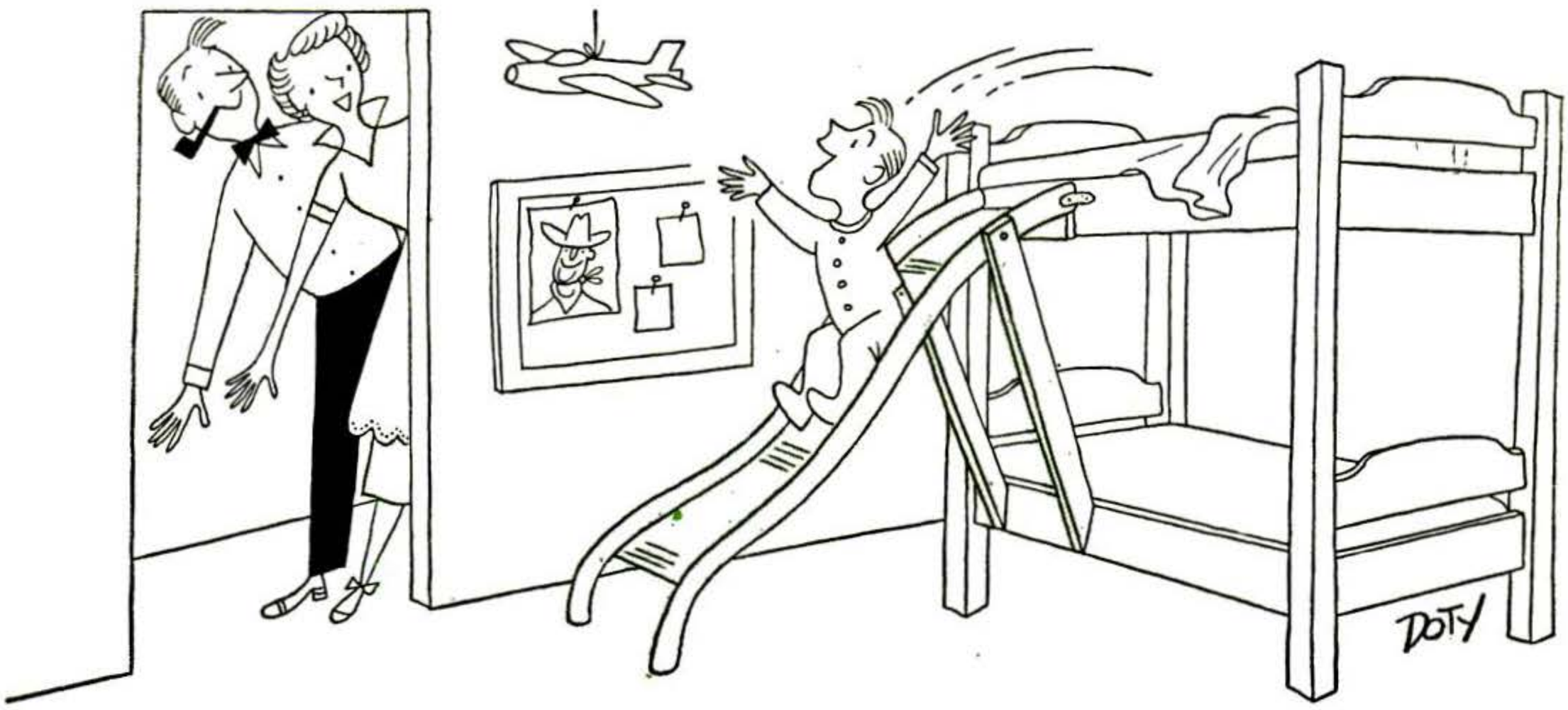

Next Month: A coffee table that holds everything but the coffee

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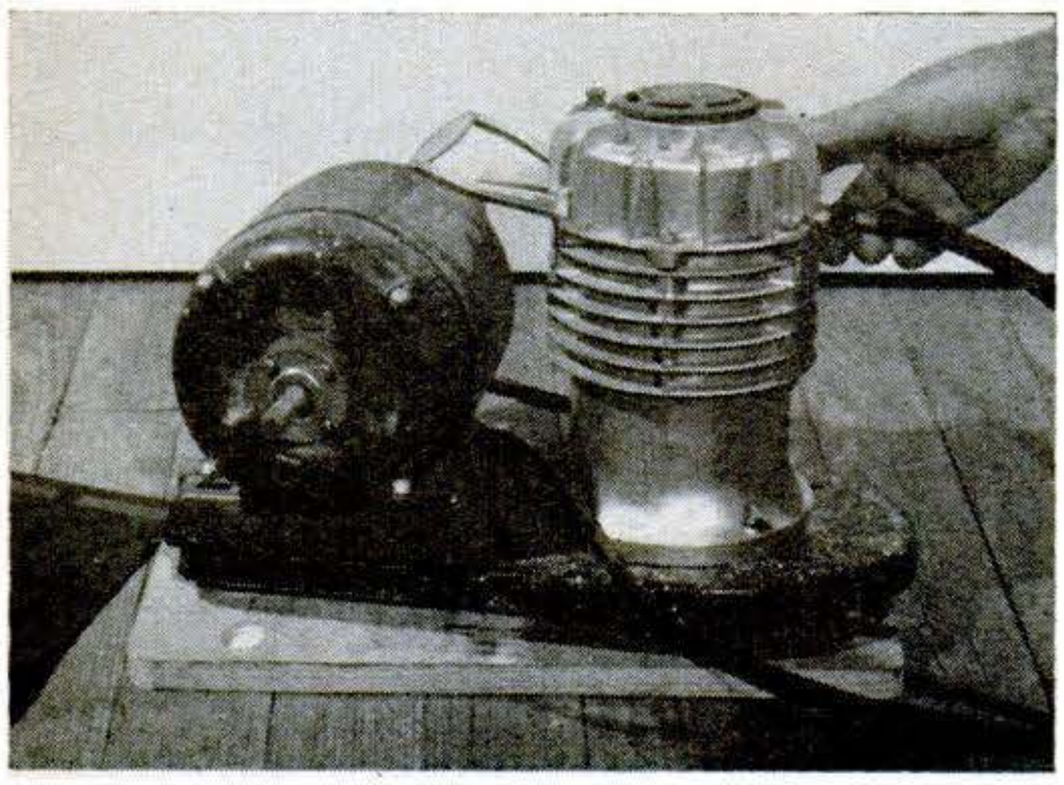
Handy Wall File in a Jiffy

DON'T throw away that limp old window-shade roller you just replaced. Its long coil spring will serve as a holder for letters, memos and recipes you want to get at in a hurry. Shape eyes on both ends of the spring and attach it under slight tension to a strip of plywood, using thumbtacks or small nails. Drill holes through the wood above and below the spring and fasten the board to the wall with wood screws.—*Glen F. Stillwell, Manhattan Beach, Calif.*

Plastic Keeps Putty Pliable

TO PREVENT putty from drying out, put it in a plastic bag and seal tightly. Kneading the putty makes it soft to use again.—*Ted Otsu, Vancouver, Canada.*



Pad Anchors Air Compressor

EVERY time I used my air compressor on a smooth floor, vibrations caused it to move. I stopped this by mounting the compressor on a baseboard with a rubber mat underneath. Holes drilled in the board fit the unit's spring feet.—*Ken Murray, Colon, Mich.*

Disk Makes Candle Warmer Safe

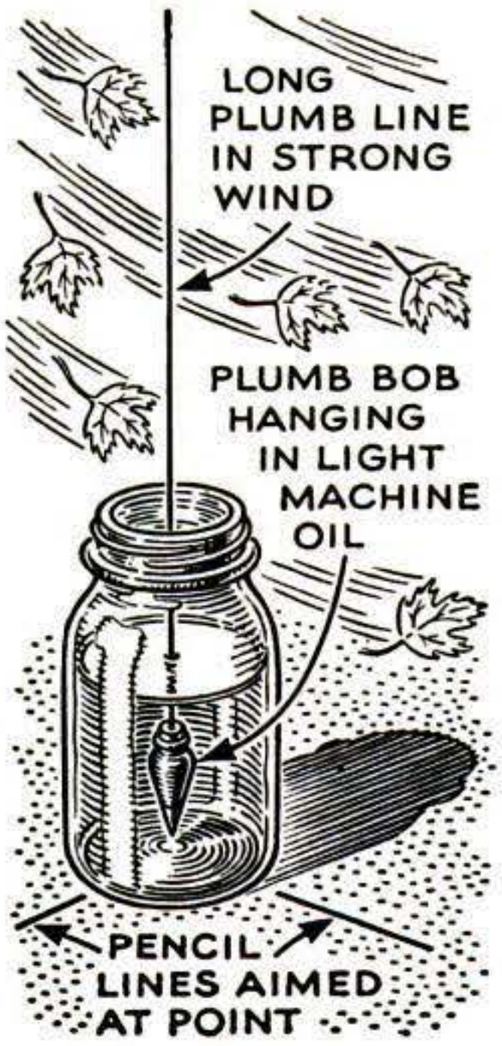
SMALL pots may not rest securely on the three-wire grate of a small candle warmer. To keep them from tipping over, cut a copper or aluminum disk to a size that will fit inside the top ring. Punch or drill a few holes in the middle to let more heat through. —*Wyeth Kidwell, Willoughby, Ohio.*

Lamp Cord Positions Car

WHEN the fishing bobber on this lamp cord nestles in the corner of the windshield nearest the driver, the car is in place in the garage. Sink-stopper chains bought in a dime store were coupled together and a reflective fishing bobber was snapped to one end. Pulling the bobber turns on the garage light.—*M. C. Fleming, Pittsburgh.*

Oil Steadies Bob in Wind

YOU can steady a plumb bob on a windy day for an accurate reading by suspending the bob in a jar of light machine oil. When the bob is steady, aim a couple of lines at the point. Then remove the jar and intersect the lines to get the location of the bob point.—*Howard E. Moody, Upper Jay, N. Y.*



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YOU'LL SCRATCH YOUR HEAD, TOO, and more than once, if you undertake a project with wood from which warp, twist and bow have not been removed by proper milling procedures.

You can't make good furniture from wavy lumber. Learn about

Cutting Distortion from Cabinet Woods

By Thomas C. Mortimer*

MANY times I have watched a woodworker carefully select a beautiful piece of cabinet wood, mahogany or walnut perhaps, and then stand by while a mill hand ruins it by passing it through a thickness planer. If this is the way you also start a project, you are licked before you start. Throughout your job, warped and twisted lumber will plague you.

To avoid this, you should understand first of all how wood is processed before it reaches the lumber dealer. After green logs are cut into rough boards at the mill, they go into a kiln (drying oven) for curing. The drying process reduces mois-

**The author of this article is product manager of woodworking machines for the Delta Power Tool Division of the Rockwell Manufacturing Company.*

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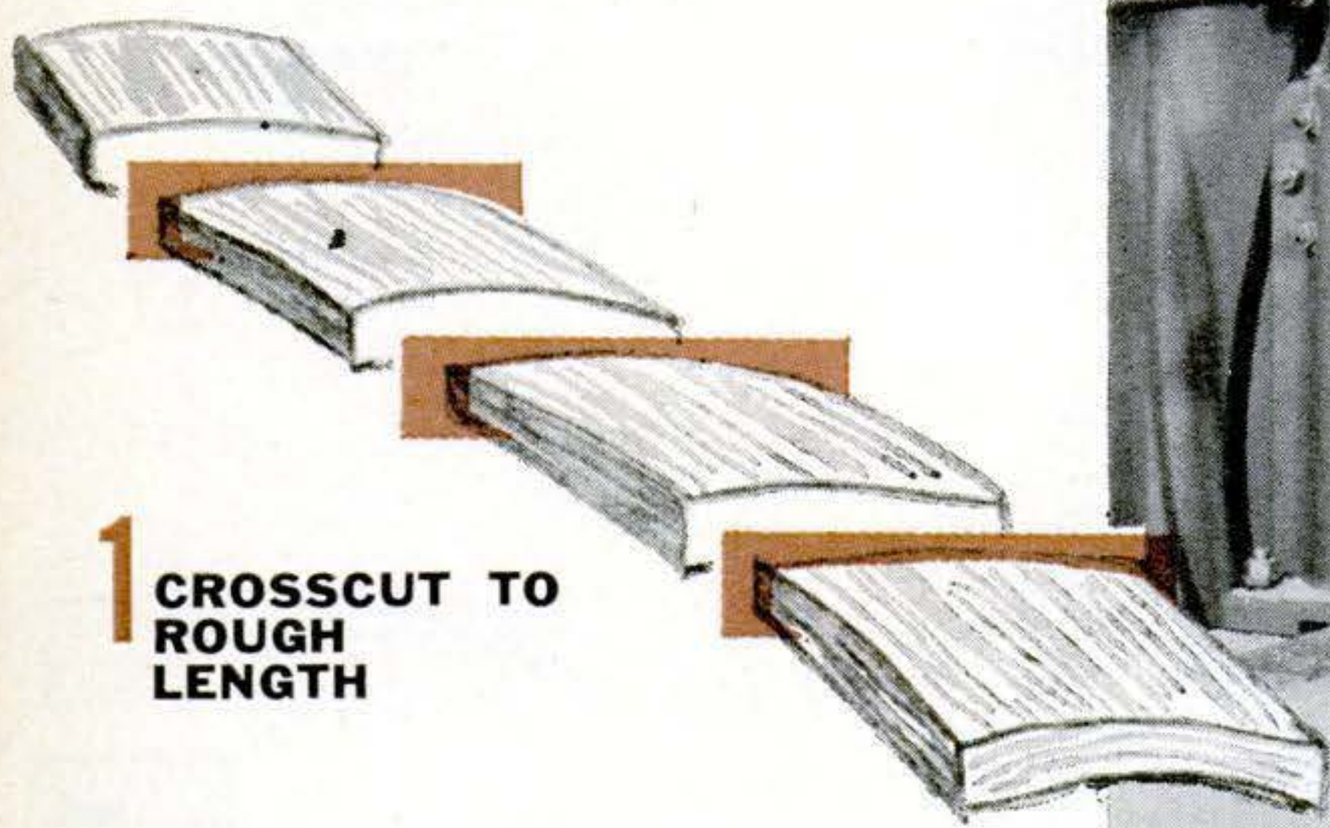
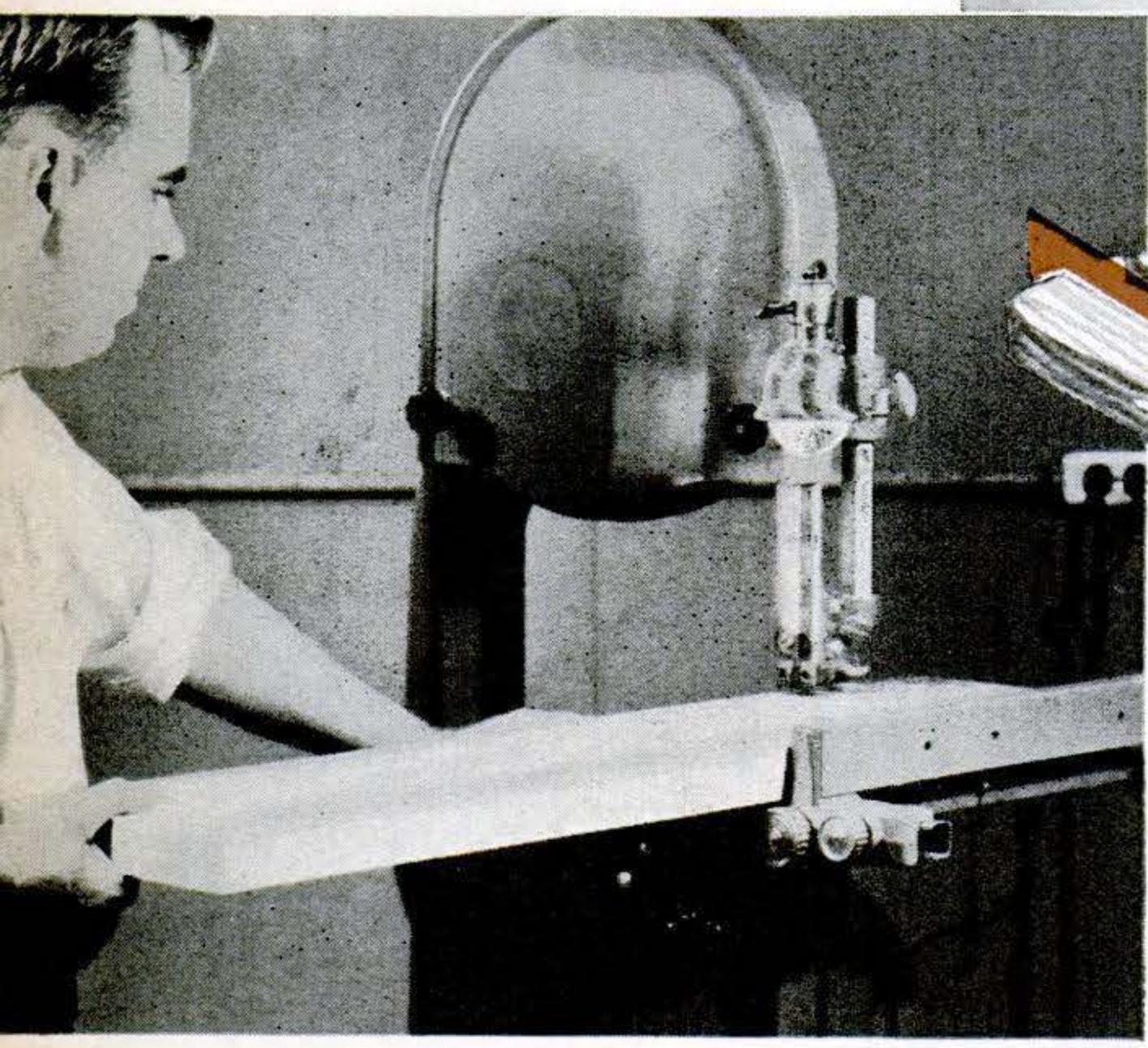
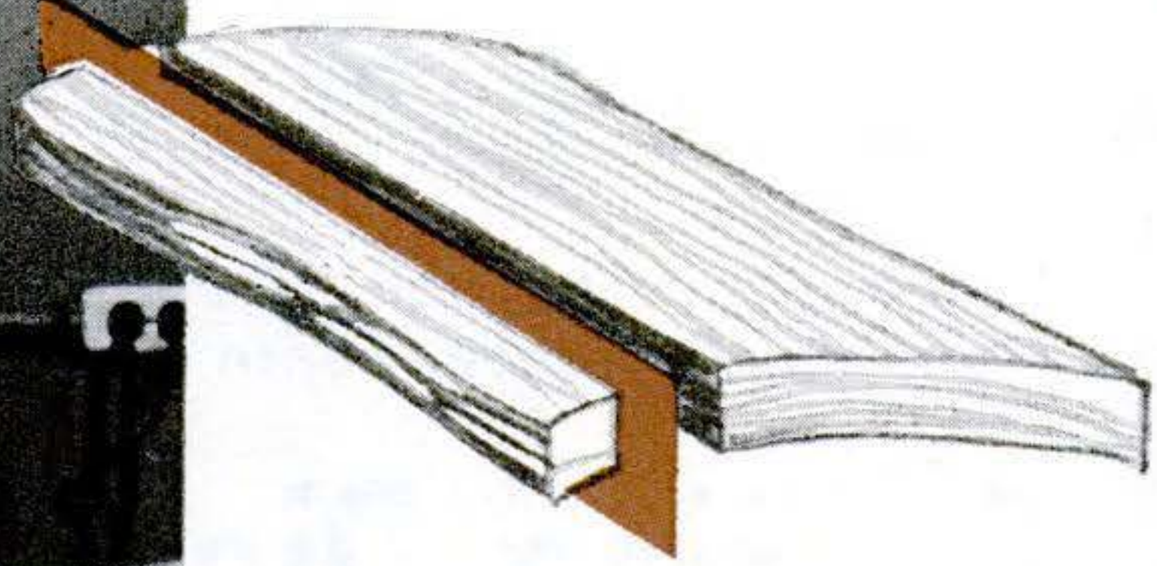
CUTTING TO ROUGH LENGTH will remove most of the twist and bow that results when rough lumber, especially hardwood, dries. Four matching drawer fronts are being made in this series of photos. Rough length is 1" longer than finished dimension.



1 CROSSCUT TO ROUGH LENGTH



2 RIP TO ROUGH WIDTH



ROUGH RIPPING comes next, rough width being ½" more than the finished. This cuts out part of warp. Author says a bandsaw with rip-fence attachment is best here. At this point the material does not yet have a true edge for cutting in a circular saw.

ture content to about 10 percent. During the process, distortion occurs and the wood warps, twists and bows. Hardwood is particularly susceptible to this kind of distortion.

At the sawmill, lumber is cut to full measure—that is, one-inch material is a full inch thick, two-inch material is a full two inches, and so on. This full measure is provided not only to allow for planing the wood smooth but also to allow for removal of the distortion that resulted from the drying process.

The only wood that should be put directly through a thickness planer in board form (full length and width) is material intended for use in carpentry work. For cabinet work or fine furniture, basic steps that skilled craftsmen have followed for centuries will give you more satisfaction in working with wood than you ever have known before.

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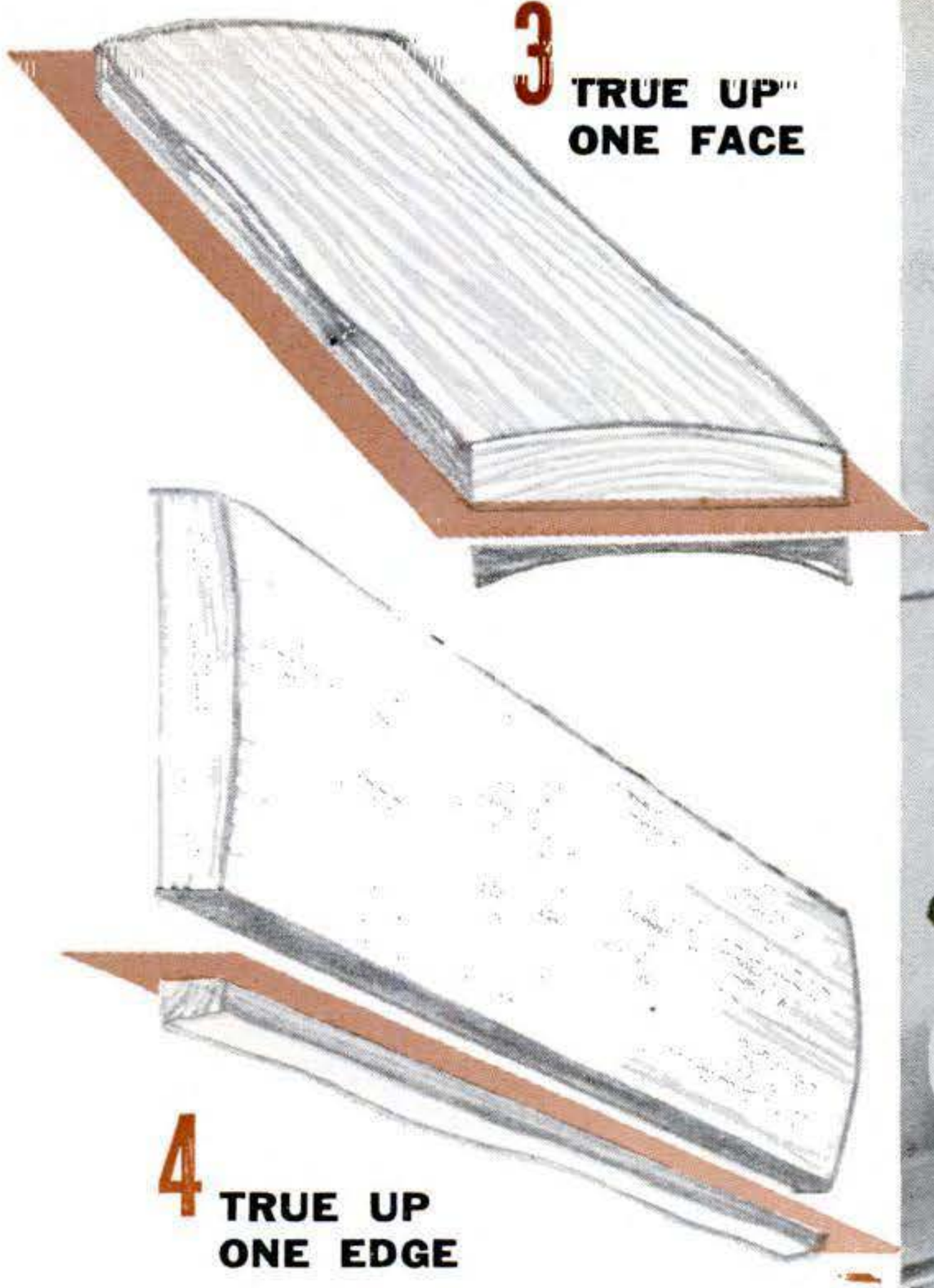

FACING, or flattening and straightening one side of the material, is the third step. A jointer is the machine for this. Feed material over the machine with only hand pressure. The author says: "If mechanical pressure, such as feed rolls, is employed, the purpose of the machine is defeated because the material will be flattened before it reaches the cutterhead. After the cutterhead has smoothed the material, warp and twist will still be there." With only hand pressure applied, warp and twist will be cut out, and one side will be perfectly flat. While still at the jointer, the piece should be placed flat against the fence and passed over the cutting head. This will give a straight edge at right angles to the faced side.

The recommended steps are detailed in the accompanying photos and drawings. To make the process easier to follow, we have taken a typical project—drawer fronts for a chest of drawers. Four are required, each to measure 32″ long, 7″ wide and 13/16″ thick.

Steps 3 and 5 require equipment that is not usually found in a home workshop—a jointer with a wide bed and a thickness planer.

If you find it necessary to have these operations performed by a local mill, take care that the mill man understands that your material is to be *faced* and planed to thickness. Otherwise, your material will surely be planed without being faced—and you will be licked before you start. The illustrations show why.

If the basic steps are followed, all four drawer fronts will be identical in dimensions—and completely free from all dis-

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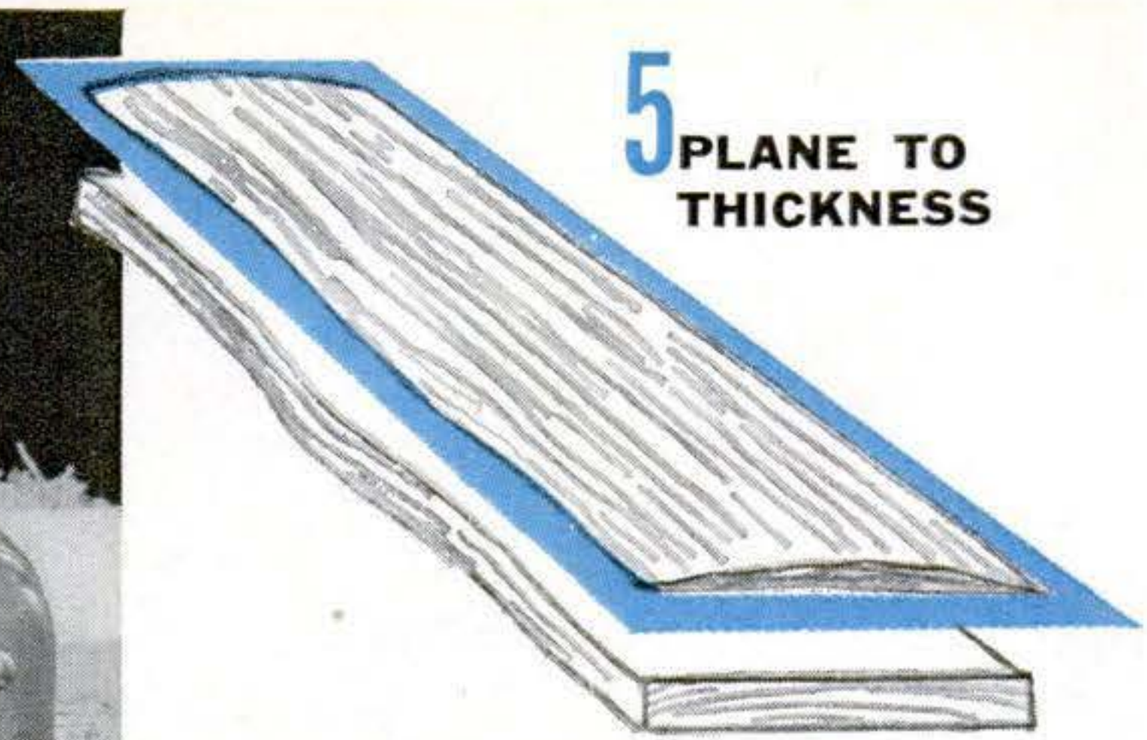
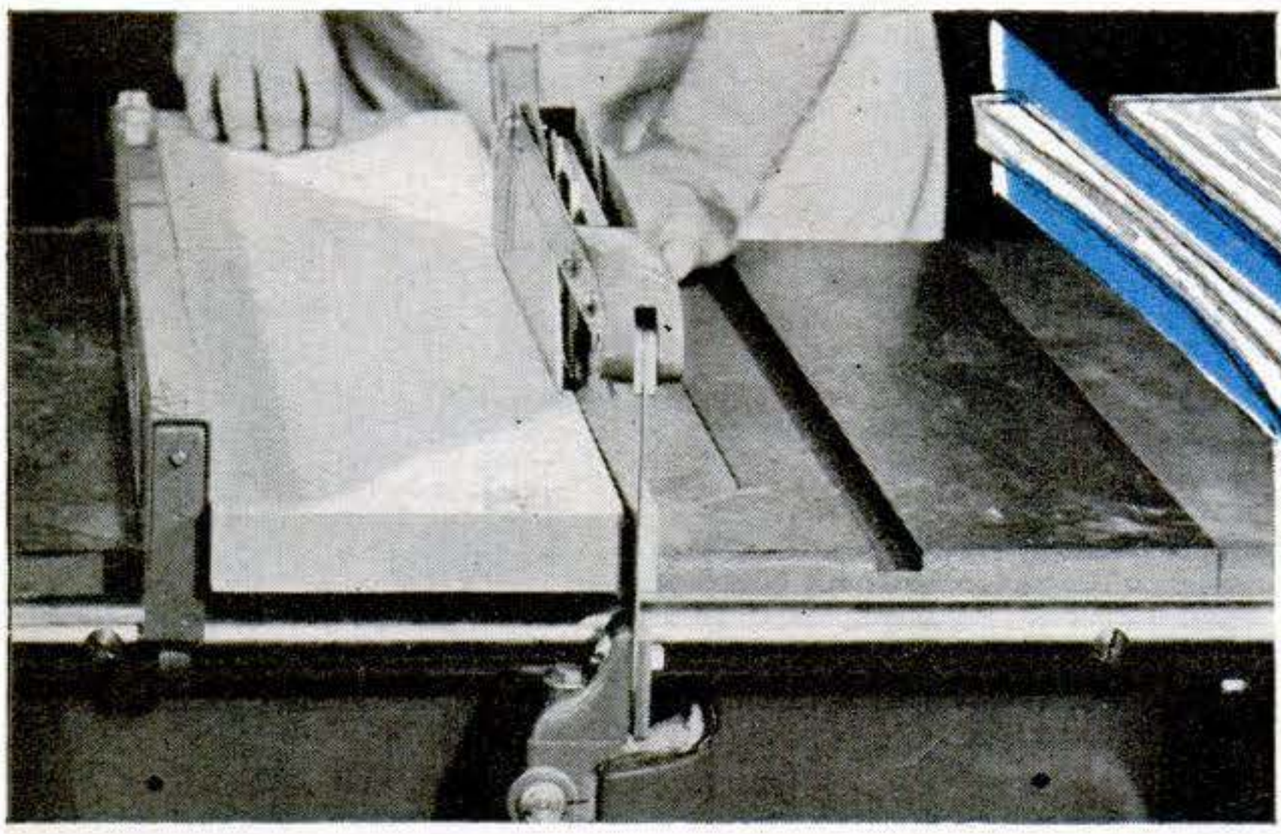
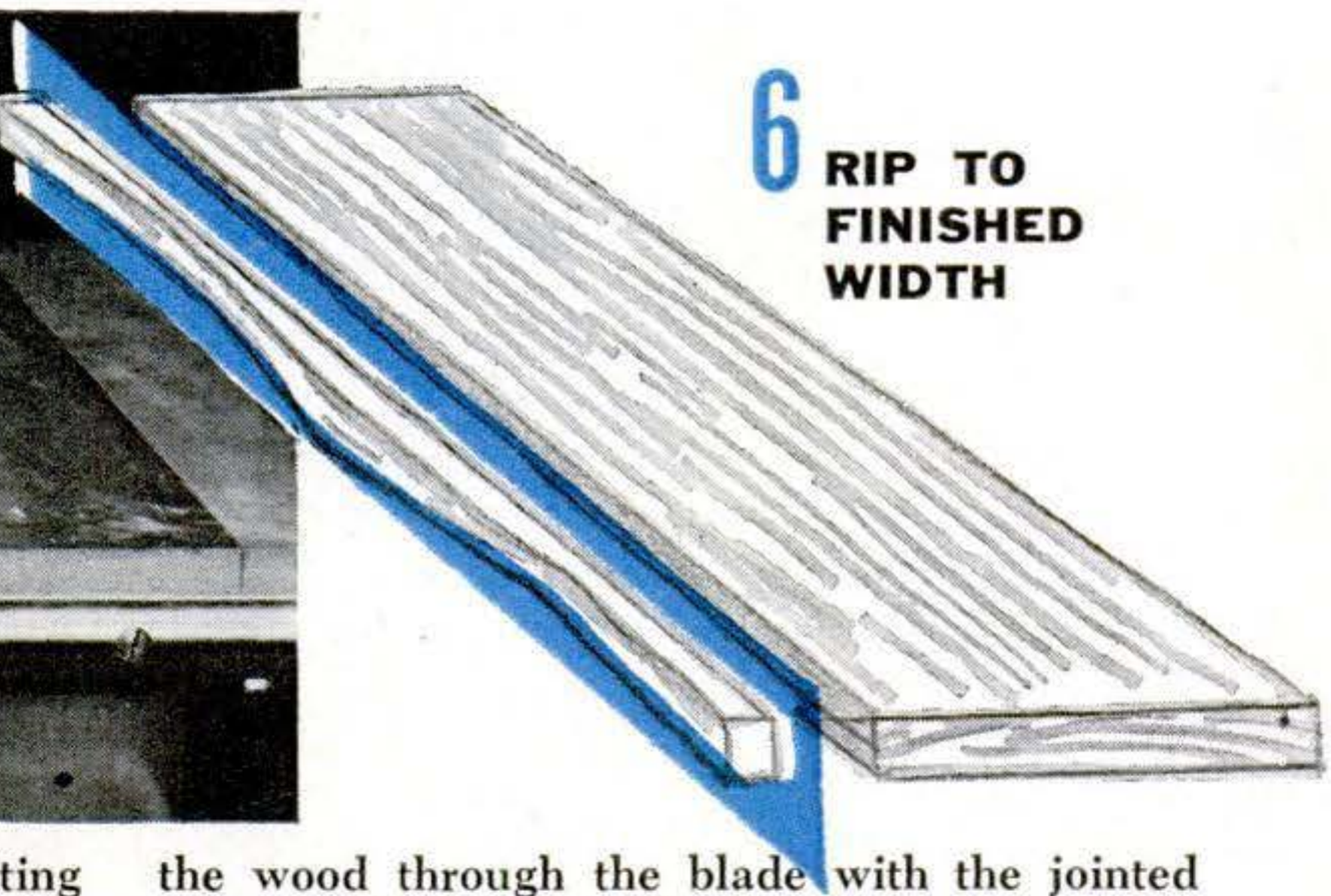
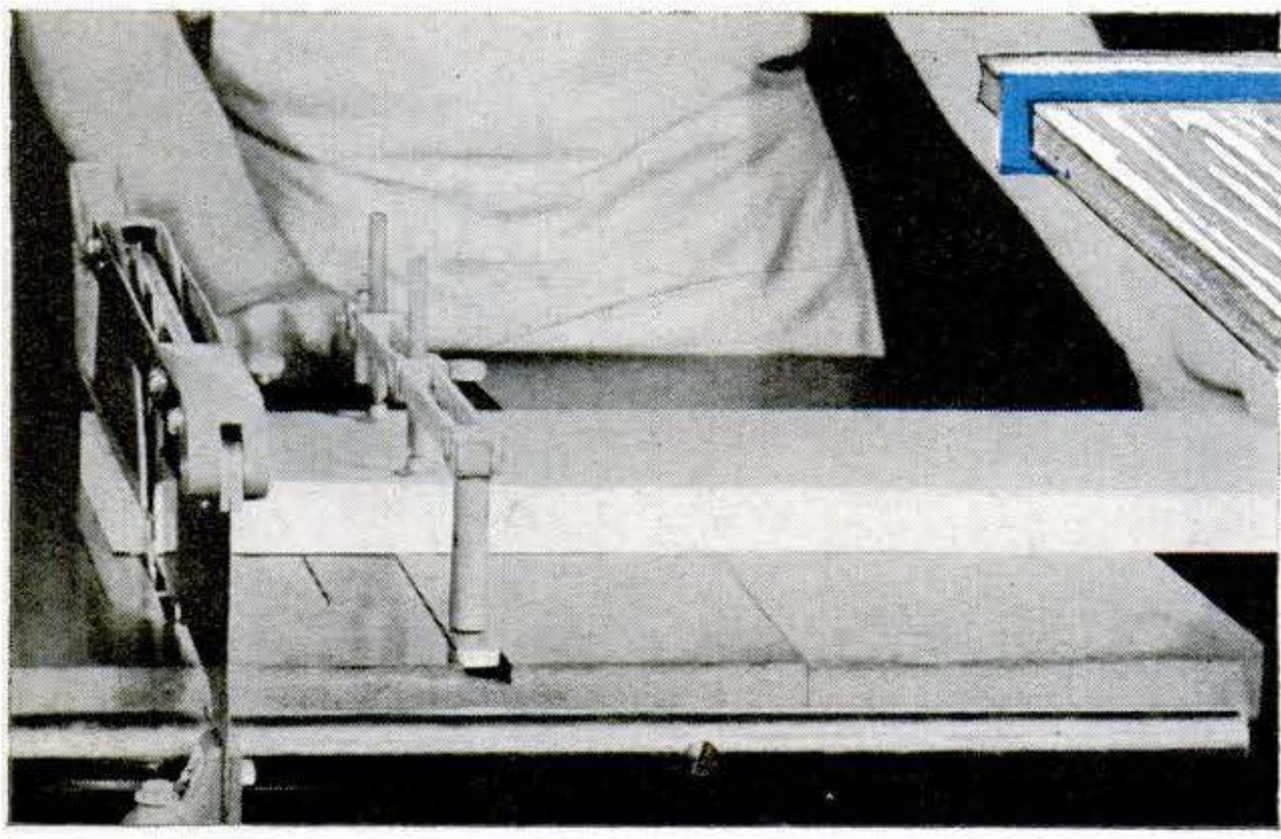


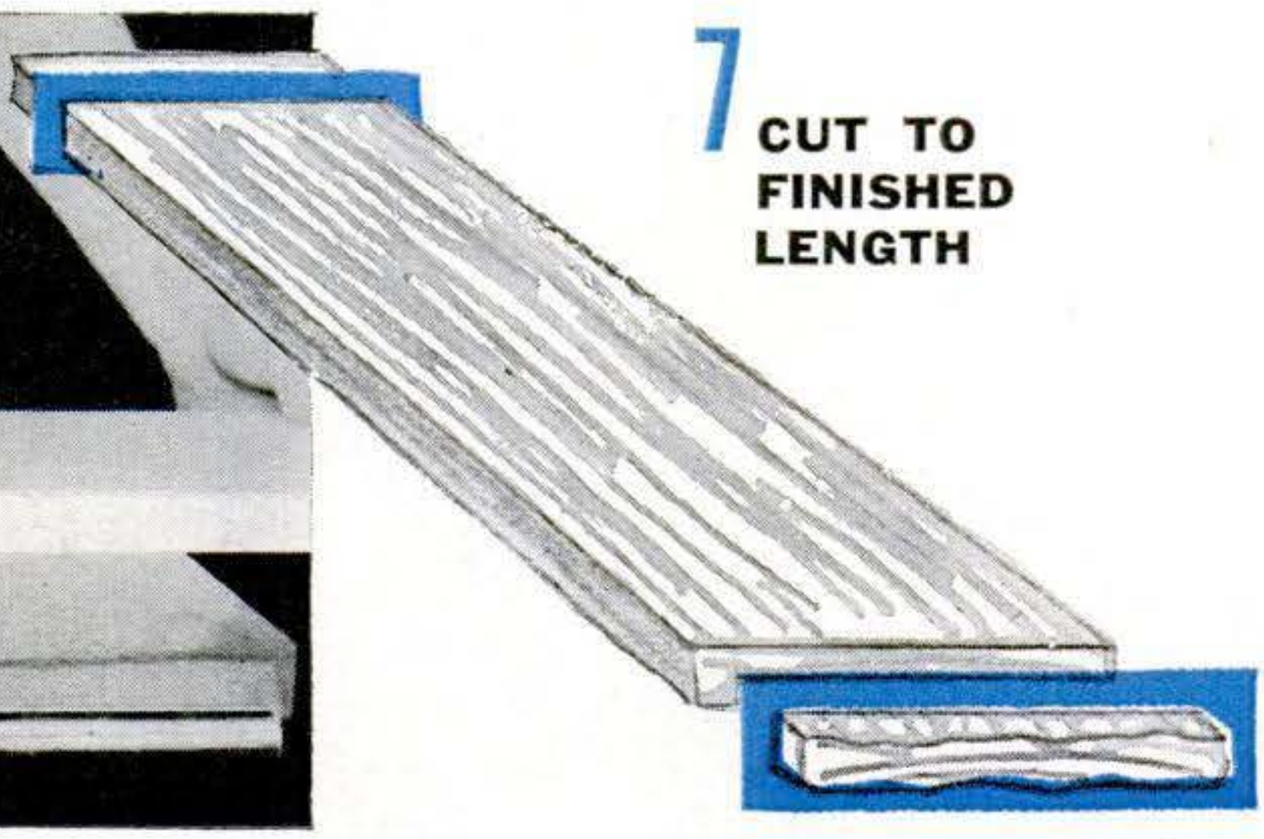
A THICKNESS PLANER gets the material next. With the faced side down, the material should be passed through the thickness planer until the finished thickness is the desired 13/16".





CUTTING TO FINISHED WIDTH is done by setting the rip fence on a circular saw and passing the wood through the blade with the jointed edge against the rip fence.





CUTTING TO FINISHED LENGTH is the final step. This is done by squaring the ends and cutting on the circular saw with the jointed edge held against the face of the miter gauge.

tortion. From that point on the drawer fronts are ready for shaping, drilling, bandsawing, routing, or any other operation that the job happens to require. It makes no difference what the parts are that you are milling. If they are to be a component part of a cabinet or a fine piece of furniture, the steps outlined should always be followed to insure a handsome finished product. END

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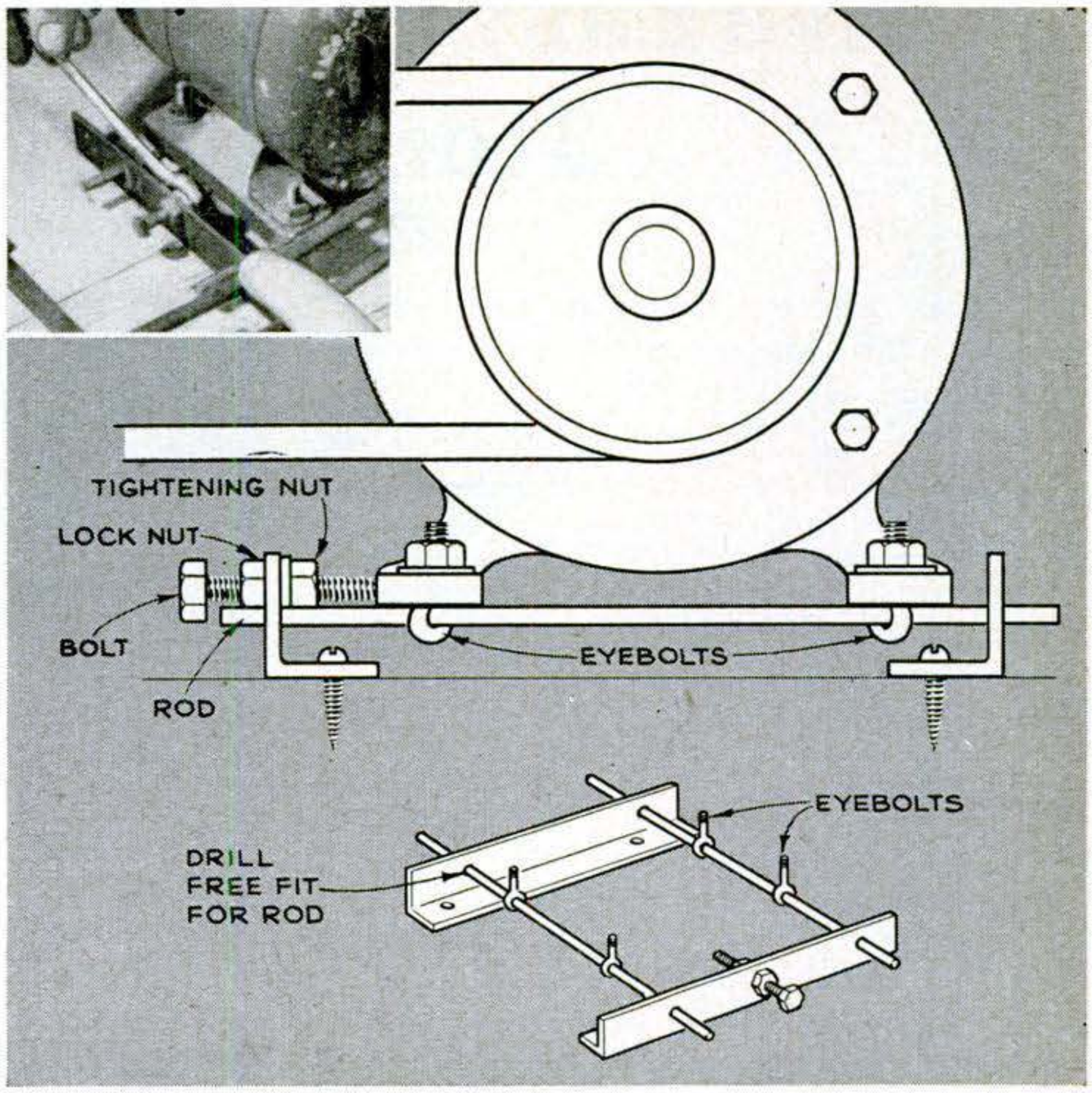
Motor Rides the Rails on This Mount to Pull Belt Taut

WHERE a floating mount is not desirable, or where precise adjustment of belt tension is needed, this homemade mount should fill the bill. It can be used for vertical as well as horizontal mounting.

Clamp two 5″ pieces of 1″ angle iron together and drill two holes through the clamped flanges the width of the motor-mounting holes apart. Open these out to a sliding fit for two pieces of 5/16″ or ⅜″ rod. In one angle iron drill a ⅜″ hole between and ¼″ above the rod holes.

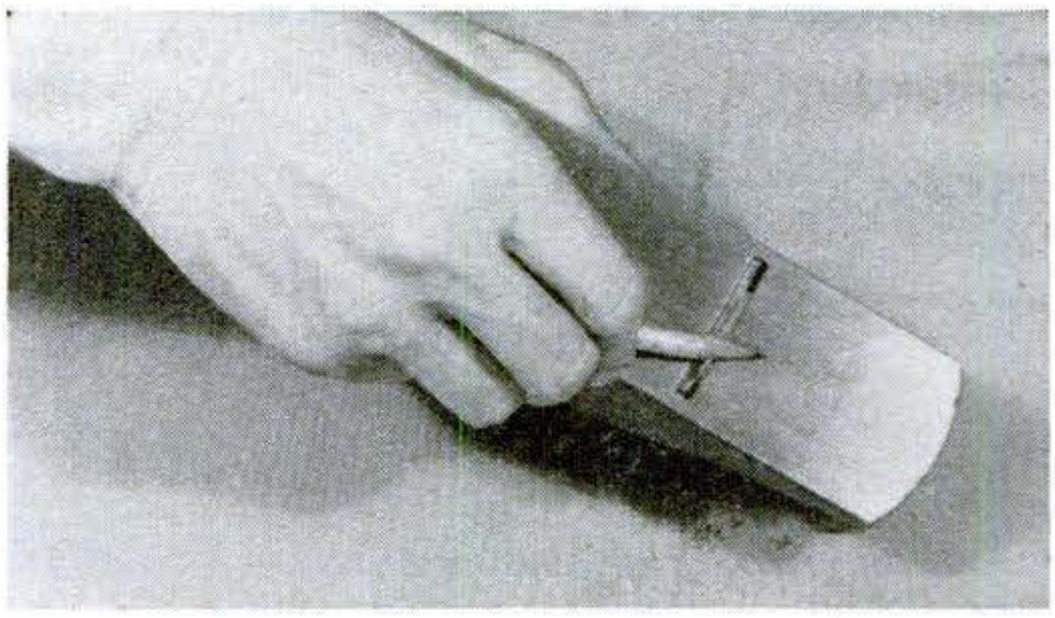
Bolt the angle irons to the bench or other support 2″ farther apart than the width of the motor base. Slide the rods into place with two close-fitting eyebolts on each. Clamp the motor on the rods by tightening nuts over washers on the eyebolts.

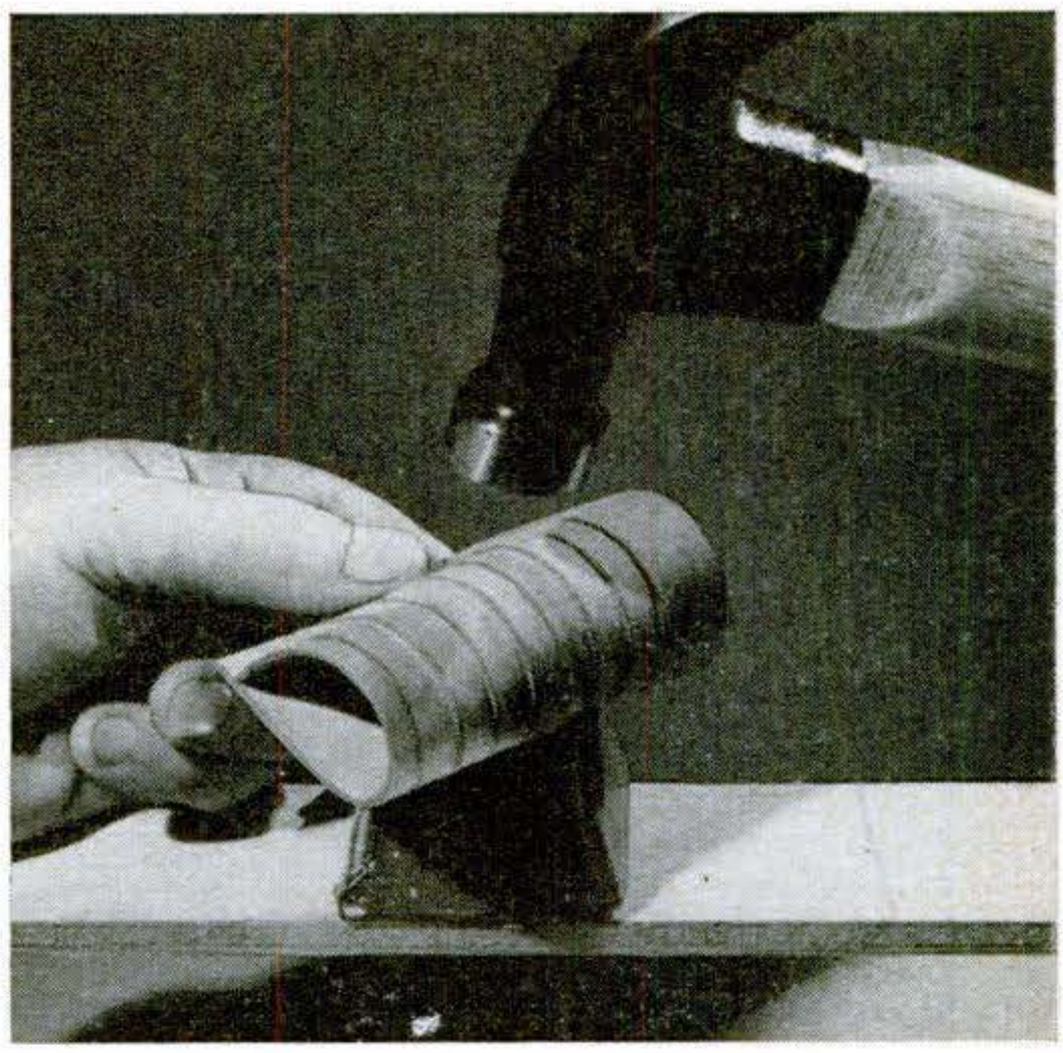
A ⅜″-by-2″ bolt in the extra hole bears against the motor base as shown in the drawing. Loosen one nut and tighten the other when you want to draw the motor forward or back.—*J. M. Finn, Pittstown, N. J.*



Erasers Make Antiscratch Pads

PADS to keep ash trays, lamps and other objects from scratching a table surface can be cut from long rubber erasers. Slice the eraser crosswise with a razor blade. Cement to the bottom of the object.





Plane Sharpens Shop Pencils

YOU can use a plane to keep a sharp point on your shop pencil by pulling the pencil at an angle against the blade. Turn the pencil after each shaving.—*Roland Loewen, Chattanooga, Tenn.*

Crack Nuts Inside Rubber

WHEN you crack hard-shelled nuts, fold them inside a piece of rubber cut from an inner tube. The meats are less likely to be crushed and the shells won't fly around the room.—*Ken Murray, Colon, Mich.*

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Five Easy Ways You Can Add Storage in Your Home

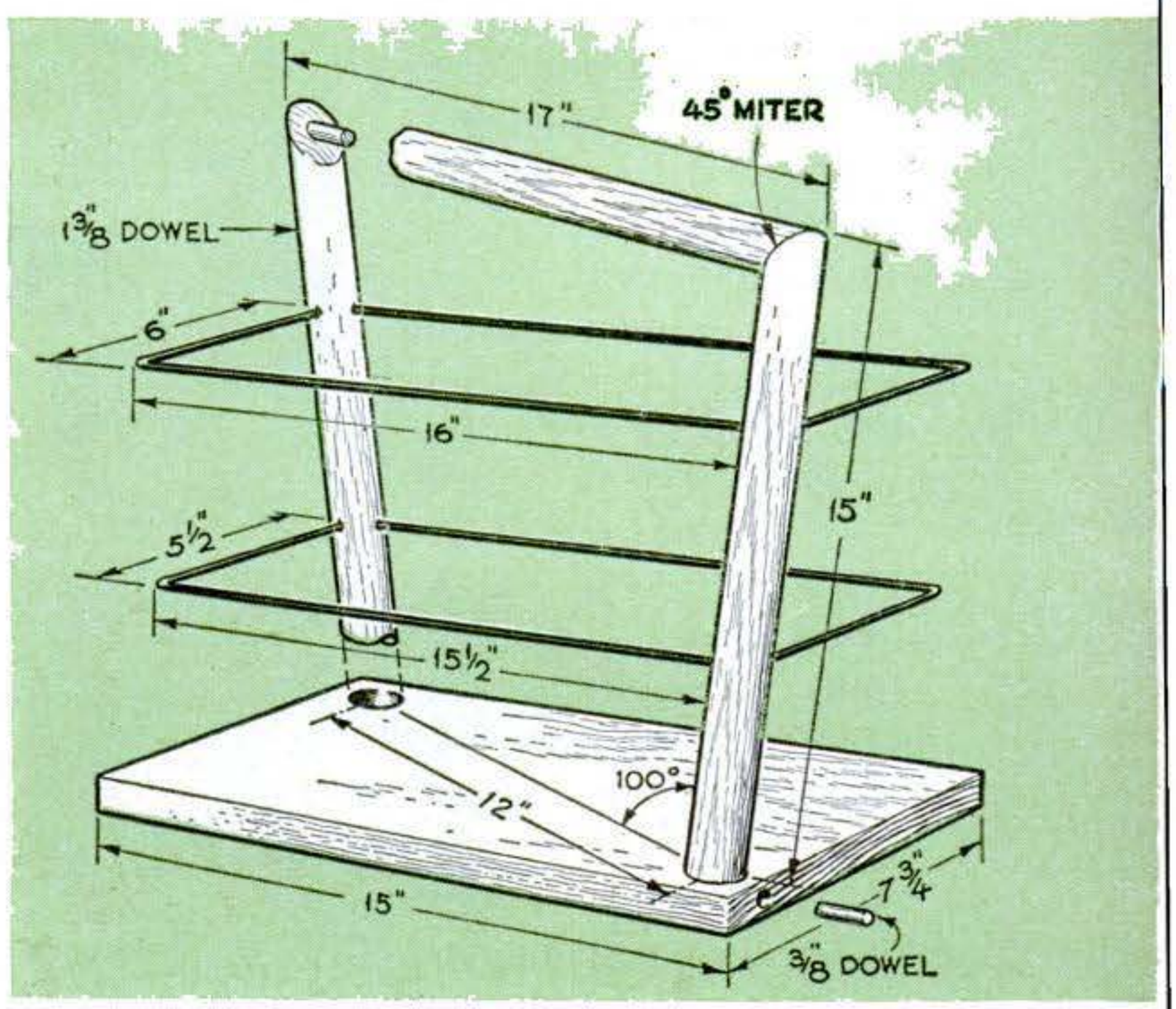
1 YOUR favorite magazines are neatly held in a rack of oak or other hardwood and No. 9-gauge steel wire.

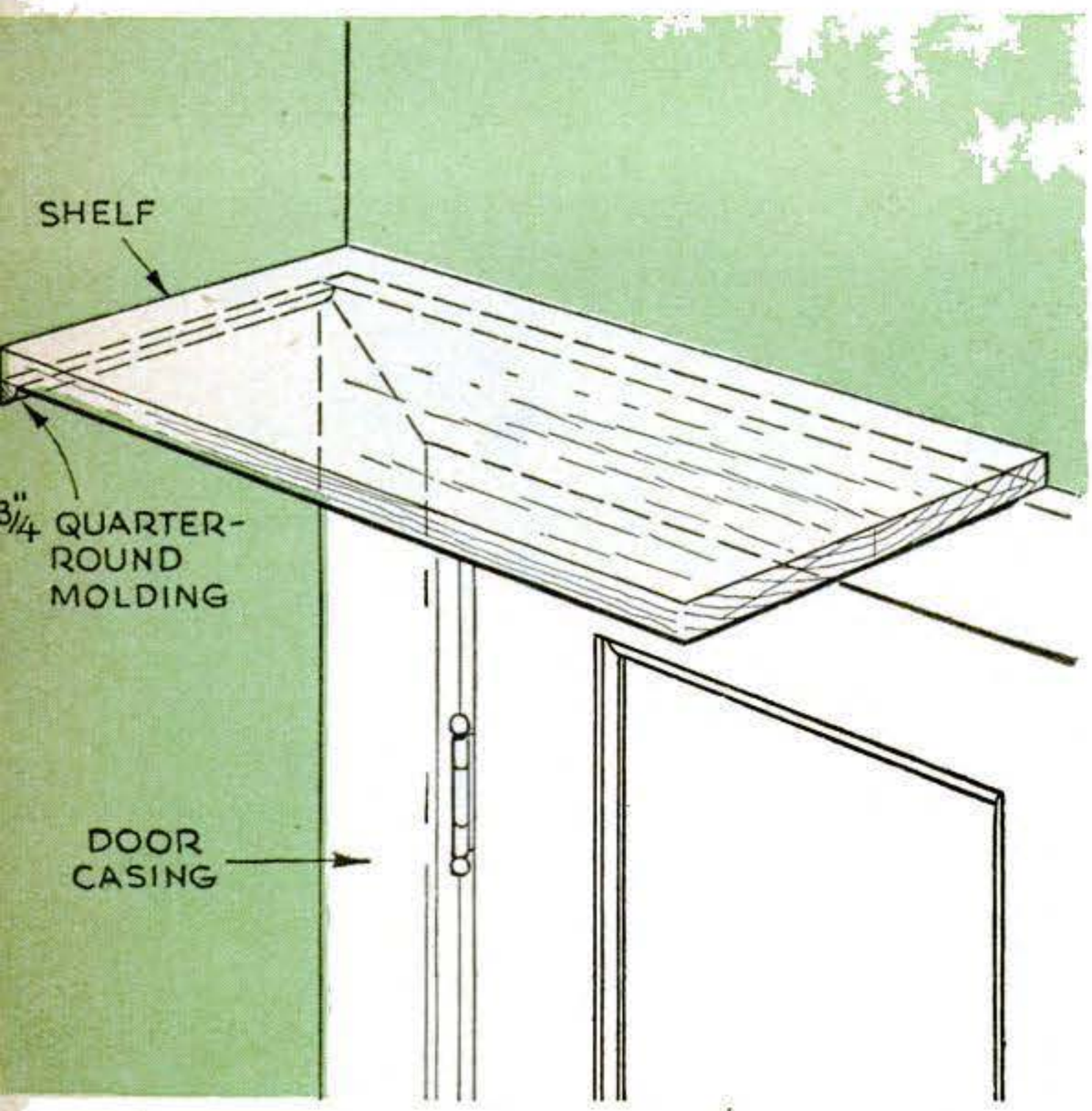
Trim and true the base. Mark 1⅜″ holes 2″ from two corners joined by a diagonal, and bore at a 100° angle.

The arch is of 1⅜″ dowels mitered 40° for the joints. A guide block helps start the crosspiece cuts at the same point on the circumference. Using a block jig, drill for ⅜″ doweling, and glue in place. Glue in the uprights, drill through the ends of the base, glue in anchor dowels, trim flush, and clamp until the glue sets.

Hammer sharp right-angle bends in the wires, and glue them into No. 9-gauge holes drilled ½″ into the uprights.

Sand, stain, and finish with clear varnish. Enamel the wires dull black.





2 A HANDY shelf for small, infrequently used odds and ends may be installed on top of a hall or closet doorframe. Square and sand a suitable length of board; then saw off a length of quarter-round molding to the width of the board less that of the doorframe, and use the frame and molding to support one side and end.

3 THIS informal magazine rack, useful in a small den or playroom, has two sloping sides of ¾″ stock nailed to a ¾″-by-3″-by-12″ bottom piece and a back of ½″ plywood. The front is perforated sheet metal held in place by a three-sided rabbeted-and-mitered frame. Screw it to the back of a door to save that much-needed space.

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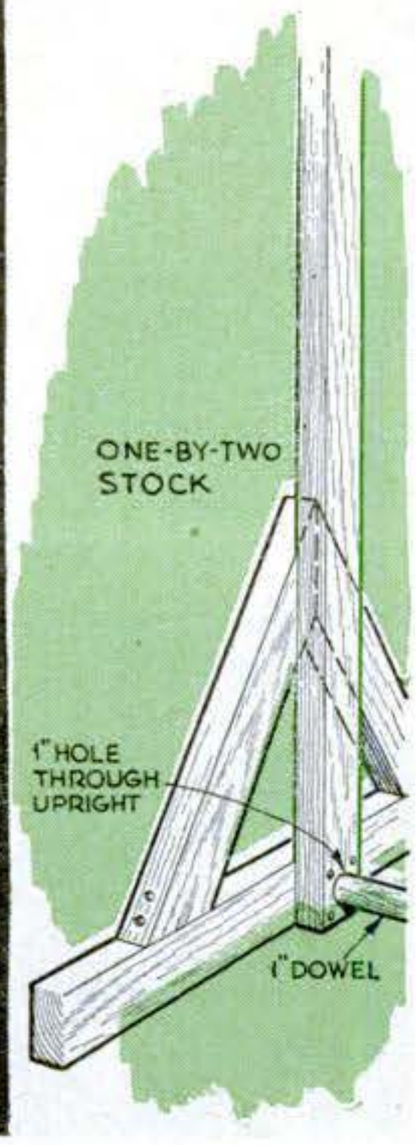
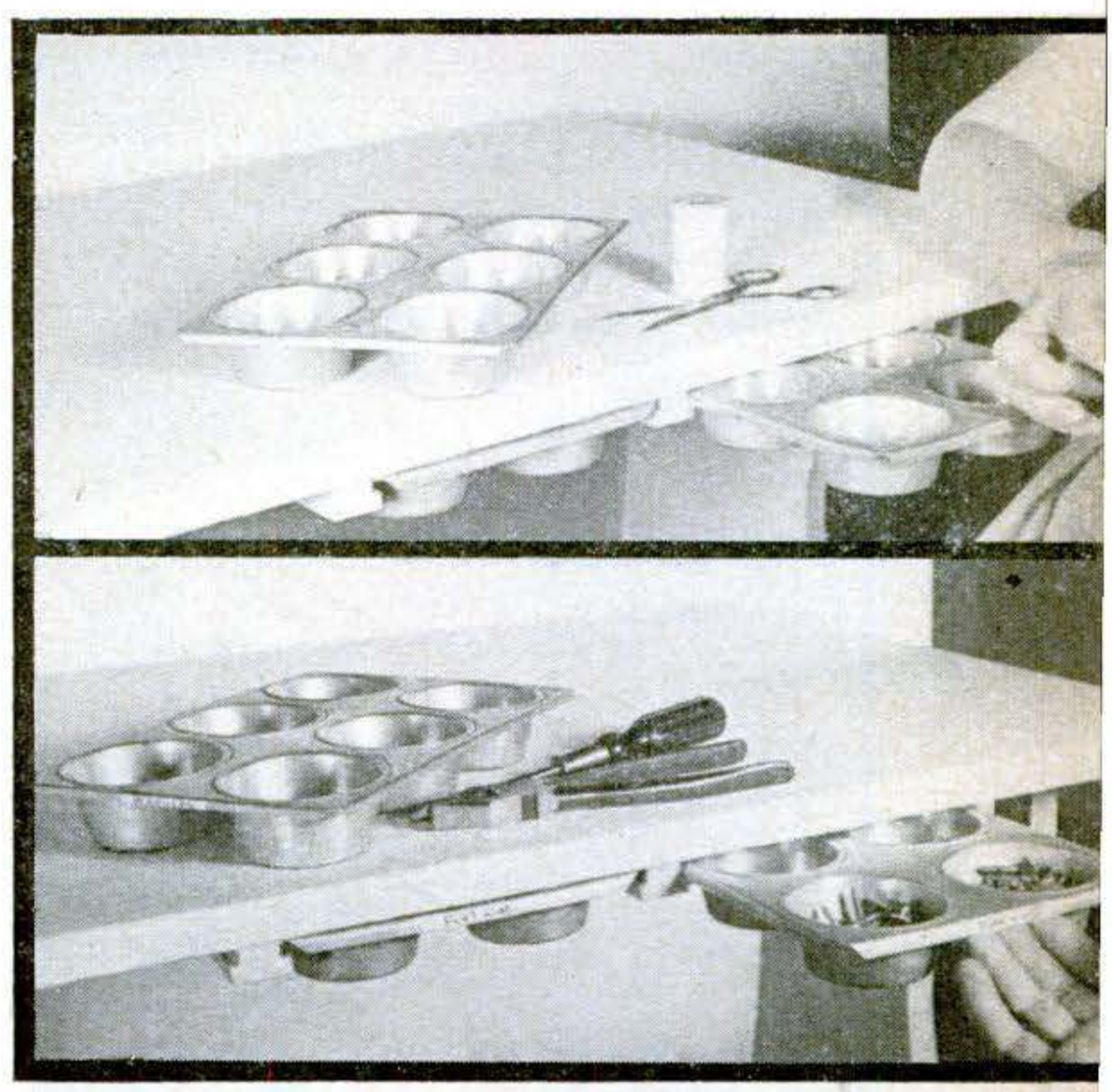
One-Evening Projects





4 THIS junior clothes rod that grows with the child has one-by-two pine or fir end racks bored to take a length of 1″ dowel or broom handle and fitting snugly the closet depth. Assemble, bracing with narrow strips of scrap 1″ lumber, and install by nailing the top ends. Saw at top and renail to raise the height as needed.

5 MUFFIN-TIN drawers are a convenience, almost a necessity, in both the workshop and sewing room. With the flanges running in cleats attached to the underside of a table or shelf, the compartments hold nails, screws, bolts, cotter pins and washers, or buttons, hooks-and-eyes, snap fasteners, pins and the like.

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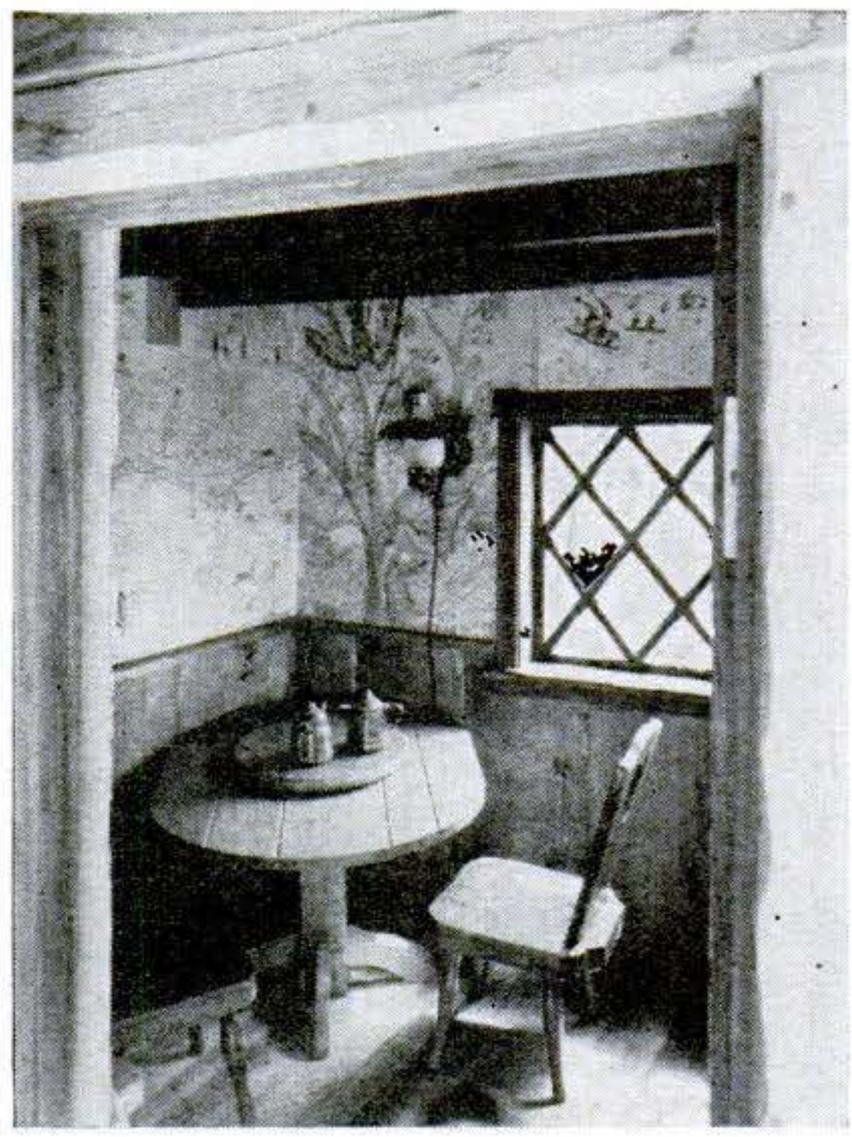
Kids Helped Build This Fairy-Tale Playhouse

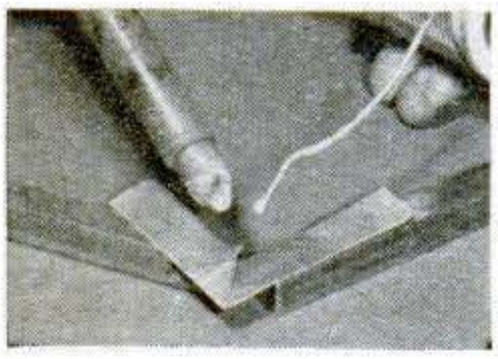


BUILT in part by the little people—children, not elves—this picturesque little playhouse looks like a prop out of Grimm's fairy tales. Neighborhood kids helped its owner and designer, Wilbur S. Tool, of Corona del Mar, Calif., put it up.

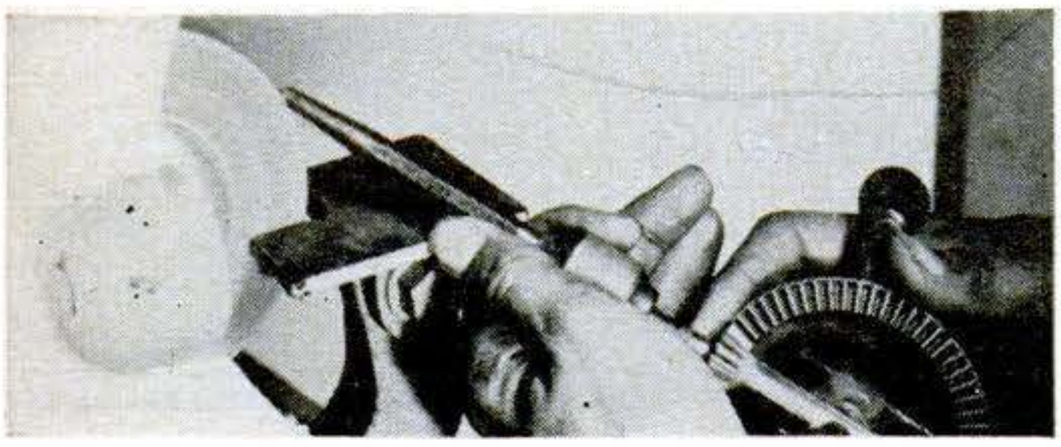
The house has two six-by-six-foot floors, the top one reached by a brick stairway. The kiddy's-eye view into the downstairs living room (above right) shows some of the handmade furniture. Wallpaper drawings were made by the children.

Siding is rough-sawed fir with vertical battens. Windows consist of hand-cut diamond panes set into a lattice frame.—*Hi Sibley, Nuevo, Calif.*

Magnets Make Soldering Jig

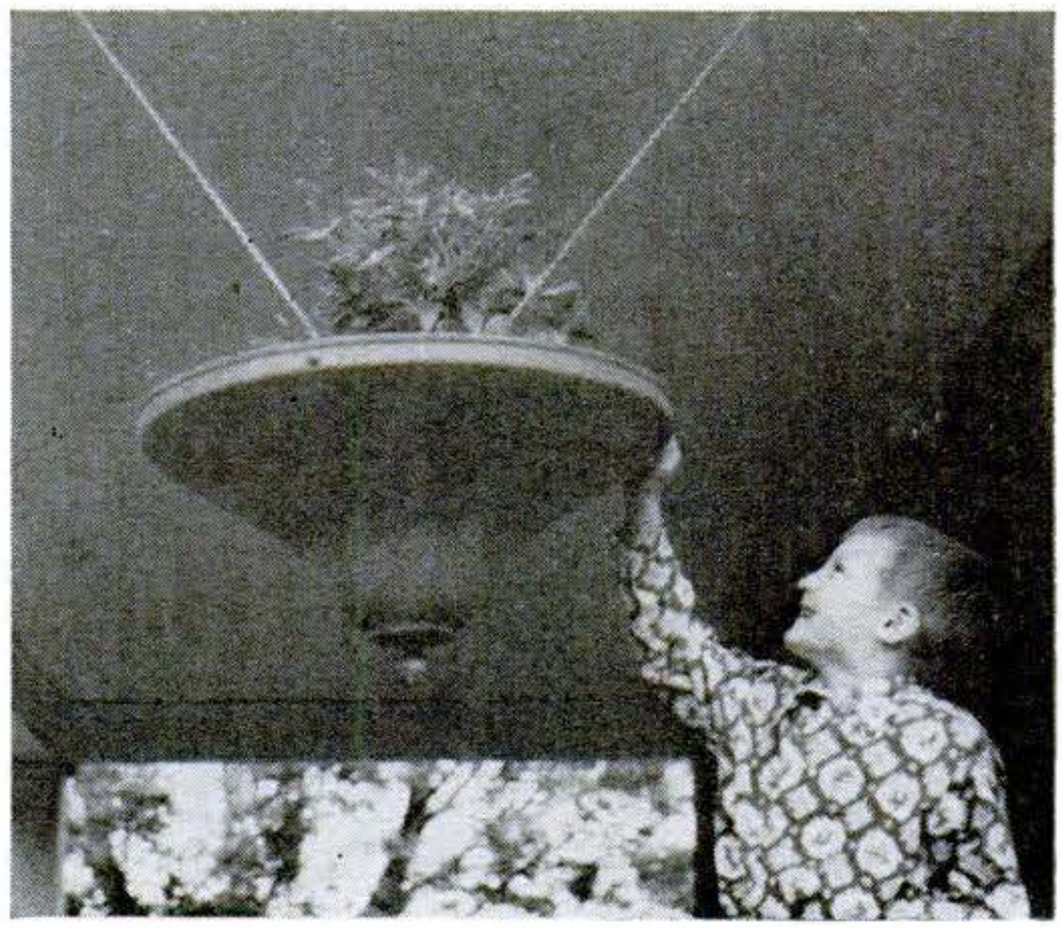


WHEN soldering small magnetic parts, use two bar magnets like this to hold them. —*Gilbert C. Close, Hawthorne, Calif.*



Drill Helps You Sharpen Punch

YOU can grind an accurate point on a small punch by chucking it in a hand drill, resting the punch on the grinding post and turning the drill while the point is being ground. Watch closely to avoid burning the point.—*Hugh Lineback, Stillwater, Okla.*



Store Lamp Serves as Planter

OLD metal lamp shades discarded from stores and other commercial establishments can be converted into fine plant holders. Suspend them like this. Such shades are usually available from a wrecking or salvage firm.—*John Krill, North Lima, Ohio.*

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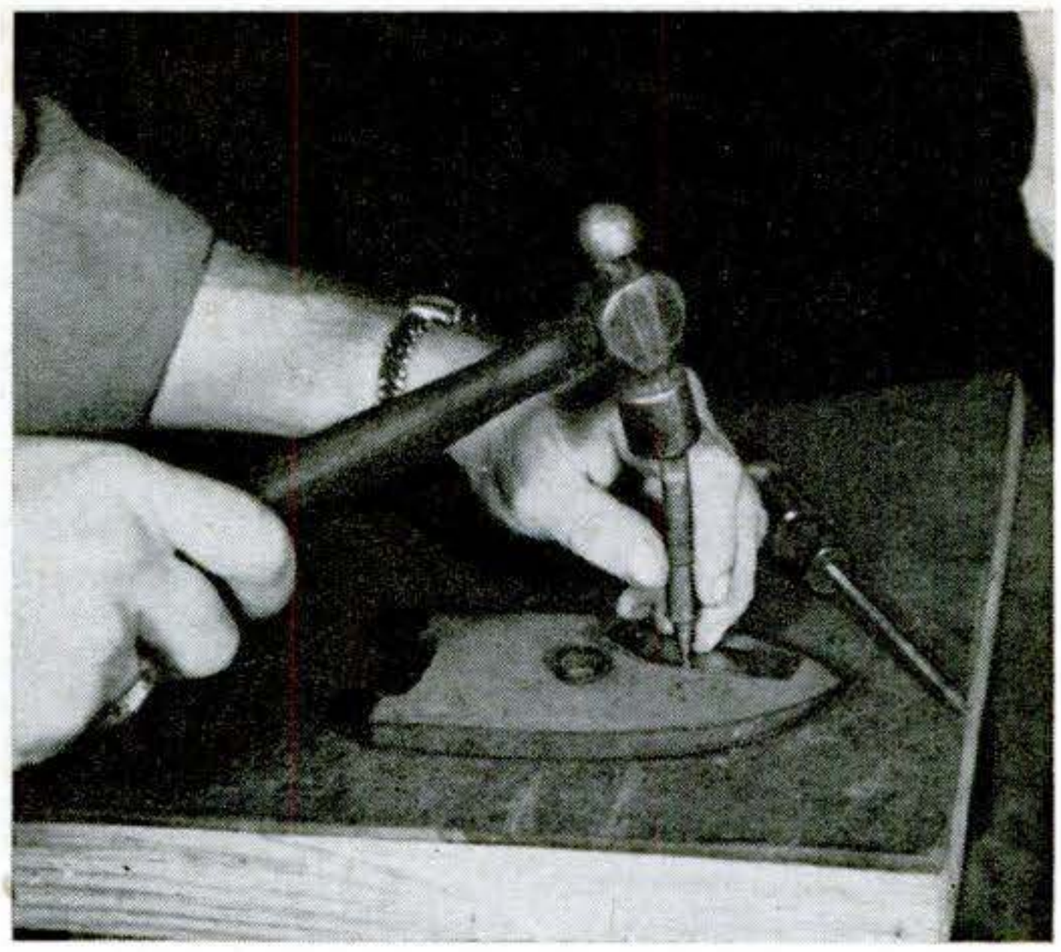
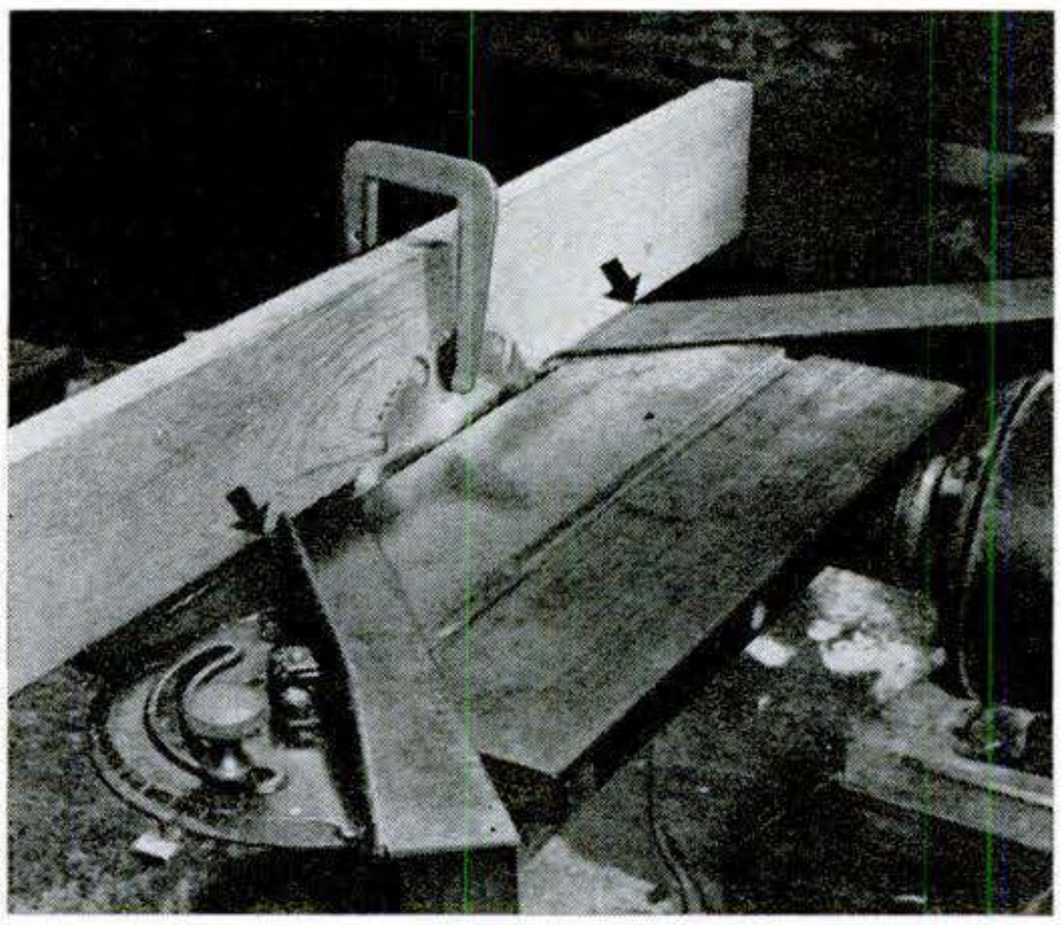
Pencil Is Kept Handy in Saw

A CARPENTER I know keeps a pencil handy in a hole drilled behind the blade in the top of his saw handle. The pencil fits snugly so it won't drop out.—*R. M. Woodbury, Natick, Mass.*



Flatiron Serves as Shop Anvil

WITH the handle removed, an old flatiron turned upside down makes a handy bench anvil. Bolt it to the bench if you desire secure anchorage.—*Philip E. McCafferty, Stanwood, Iowa.*

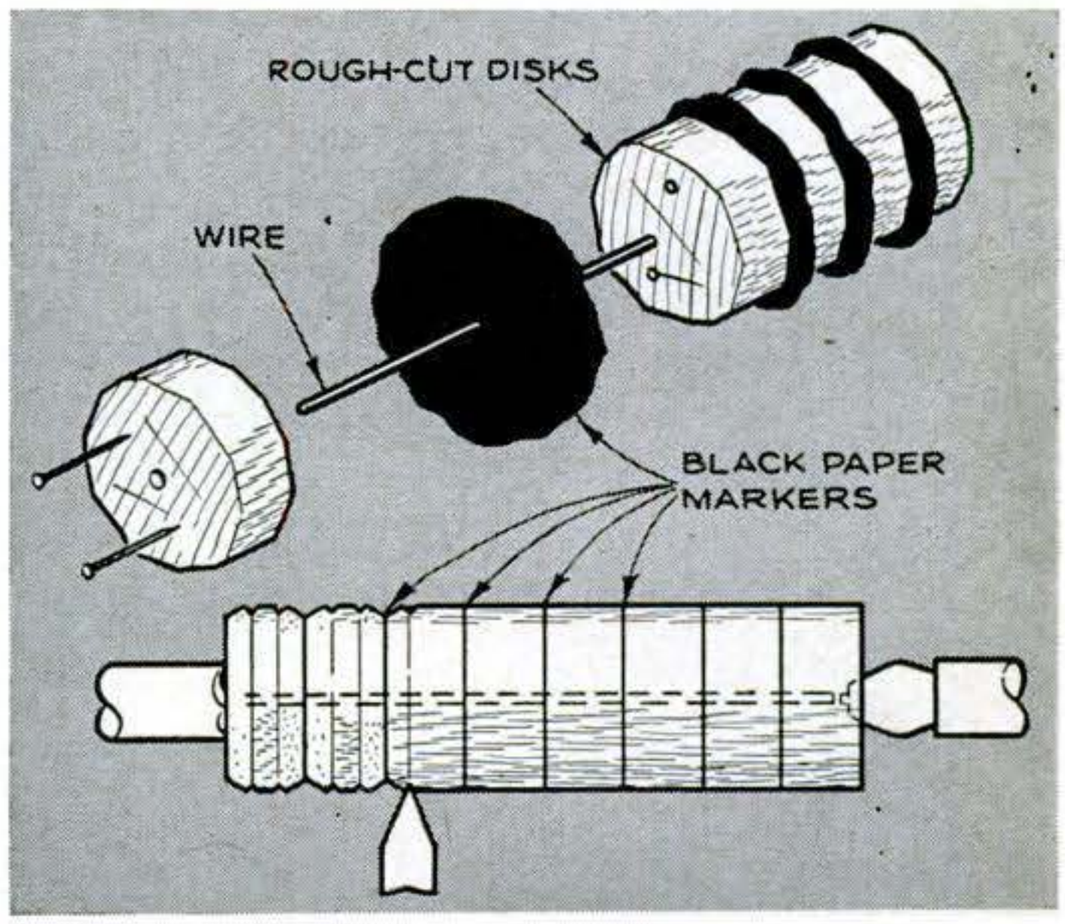


Square Sets Miter-Gauge Angle

IF YOU doubt the accuracy of your miter-gauge scale, set the head this way and it will be on the nose.

Raise the saw to maximum height. Lay a steel square flat on the side of the blade opposite the table groove to be used. Then clamp a straight board to the blade just over the square, as shown above.

Adjust the square so that the same graduation on both outside edges touches the edge of the board (arrows). Slide the miter gauge against the square and lock the head. It will be at 45° to the saw blade. Any angle whose taper per foot is known can be set the same way.—*Wendell Davis, Hampton, Conn.*



Toy Wheels Are Turned in Stack

STACKING toy-wheel blanks makes it easy to turn them true, and even to shape tire contours. In each rough disk drill a center hole that is a push fit for a straight piece of coat-hanger wire. These holes must be square to the disk faces.

Measure the stack, and cut the wire about ¼″ shorter. Slip the disks on with slips of colored paper between, nailing each to the preceding disk with two brads.

Mount the stack between lathe centers and turn true. Then shape the contour or cut grooves as desired. The paper markers serve as guides, indicating the width of each wheel.—*Harold C. Kimball, Salt Lake City.*

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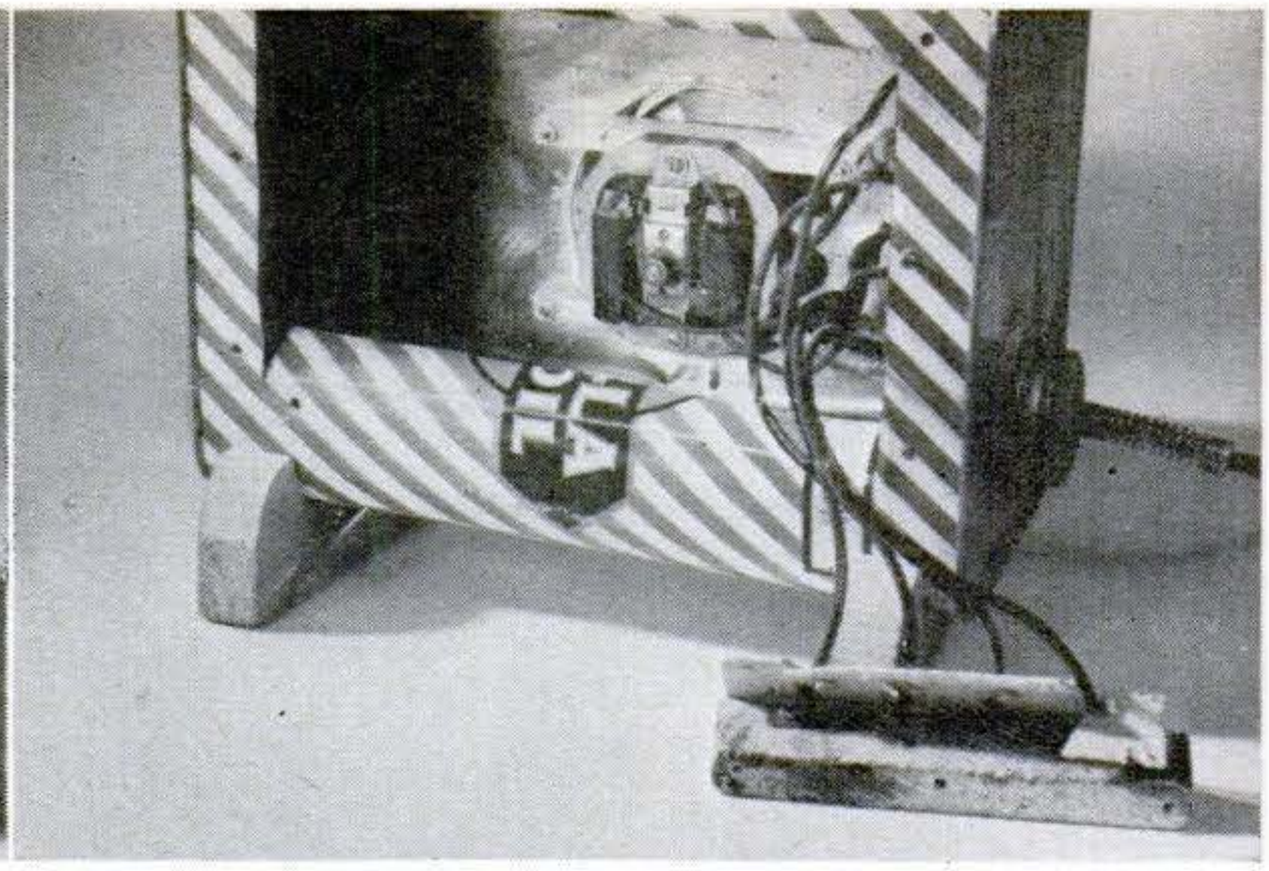
FAN DUCT is 4"-diameter section cut from large fruit-juice can and soldered to opening in rear. Fan draws air in, passes it over heating coils, and blows it out front. Solder wire screen across duct to guard fingers.



MOTOR IS MOUNTED on two cross strips bolted to can, must be carefully centered in fan duct. To lead power cord into can, punch hole in screw cap, solder in coil-type wire guard, and thread in heavy-duty appliance cable.

You Can Build a Shop Heater

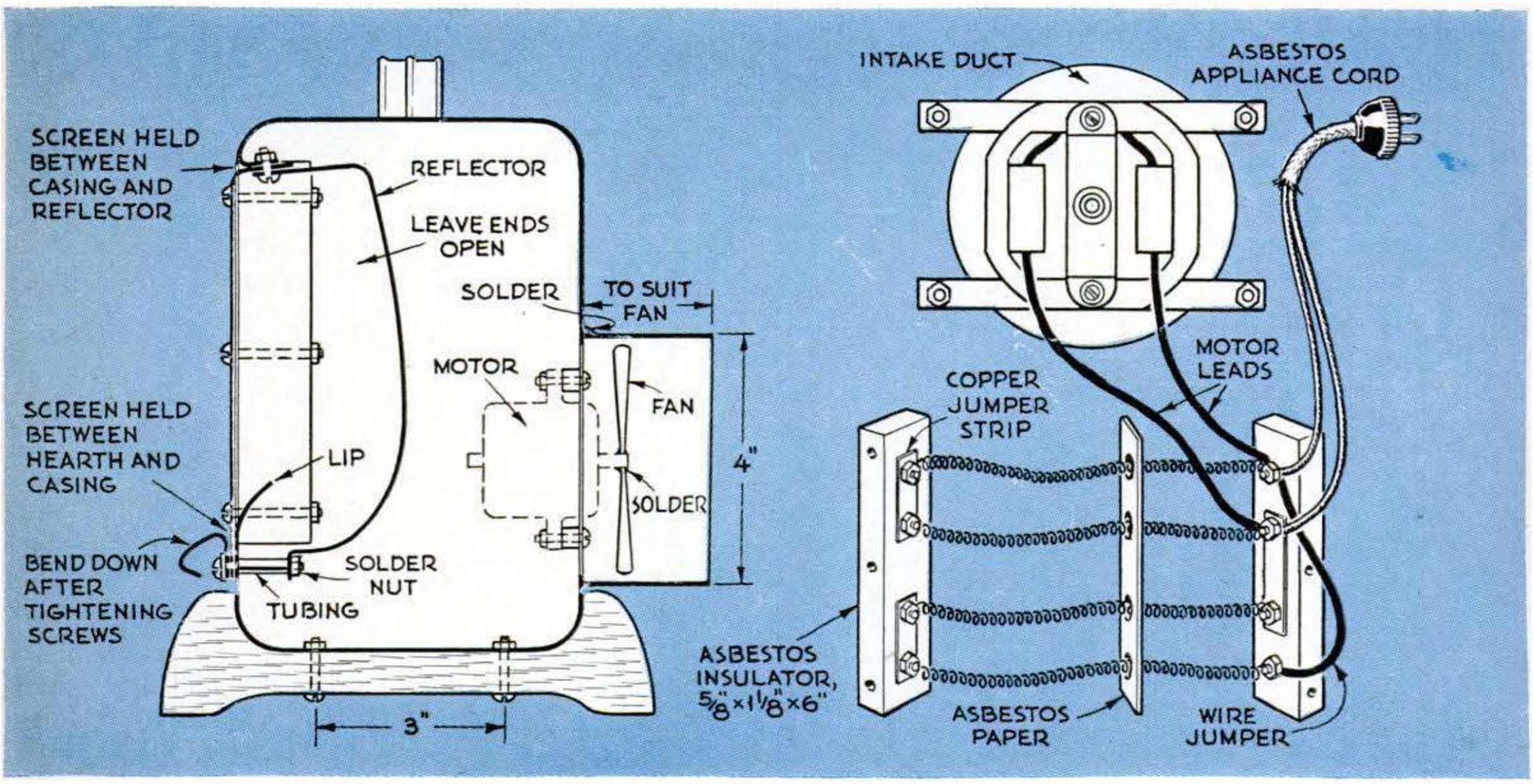
Made of $3 worth of parts, it has a motor-driven fan that blows instant warmth wherever you plug it in.

By Roy L. Clough Jr.

THIS portable electric heater is made from an old tin can—and looks it. But it sure chases chills when you're working in an unheated basement shop or need extra warmth in an attic or back bedroom.

You can make one like it for two or three dollars, and it'll do the work of heaters costing up to 10 times as much. Get yourself a clean, undented two-gallon oil can and an old phonograph-turntable motor (or shaded-pole induction motor) and you're in business.

The coils are a couple of 600-watt ni-



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chrome replacement elements, cut in half to make four lengths and wired as shown in the sketch. These cost around half a dollar at an electrical shop, and while you're there get two strips of ⅝″ asbestos for the insulators.

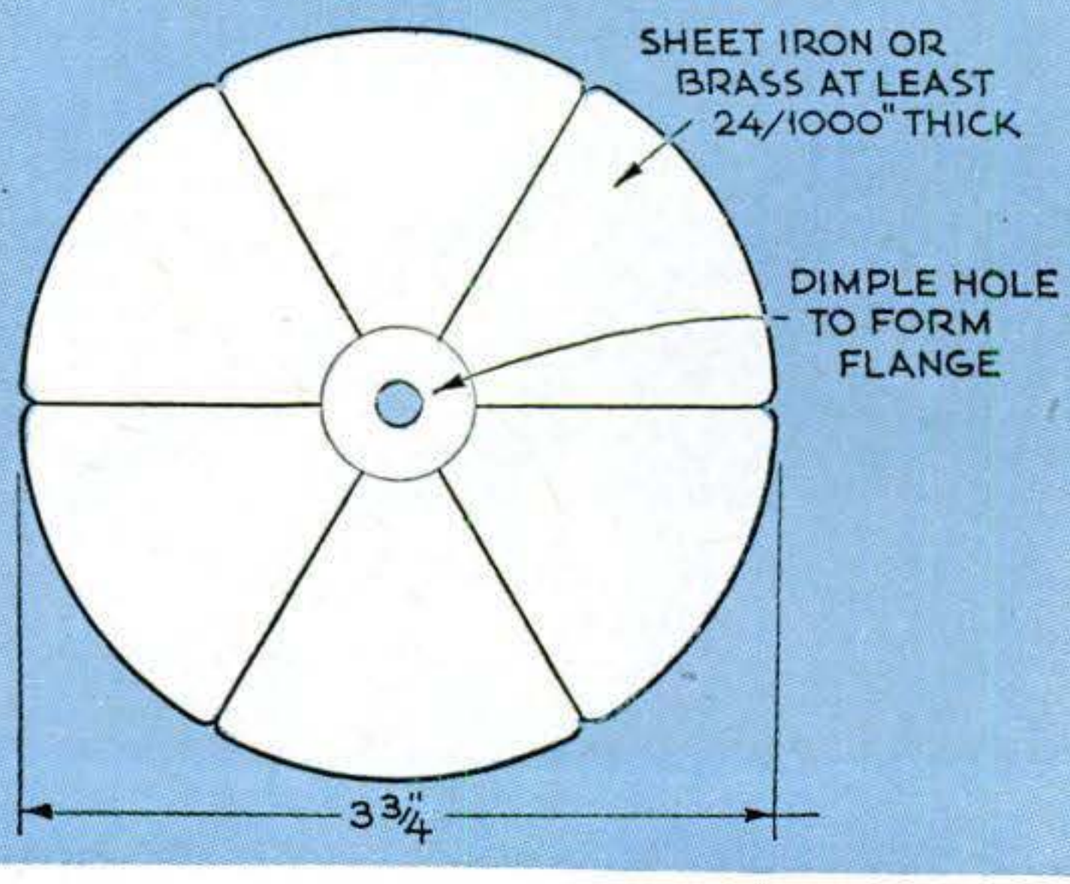
Assembling the heater is easy if you follow the right order. First cut the 3¾″ circle in back for the fan, then the 8½″-by-5⅝″ opening in front, allowing for the two lips that bend in at the top and bottom. Resolder the handle from the end to the side and bolt on the two feet, shaped by using the can as a template.

Now for the inside. Bolt the motor across the fan opening and complete all wiring to the coil and motor terminals. Solder three nuts to the inside face of the upper lip and two nuts to the inside bottom edge of the reflector. Cut a piece of wire screen slightly larger than the opening for the grille, pinch the screen's top edge between the lip and the reflector, and bolt all three together through the soldered-on nuts.

Now fasten in the insulators loosely, tuck the sides of the screen between them and the can, and draw them up tight. The bottom edge of the screen is slipped under the hearth piece and the hearth bolted on through the nuts soldered on the inside of the reflector.

If you want a real swank job, you can add an on-off toggle switch and an automatic thermostat. Just be sure they're of the correct amperage. END

FAN IS CUT from metal sheet and divided into six equal segments. Twist blades outward in the same direction that the shaft rotates to the maximum pitch they'll take without slowing down the motor.



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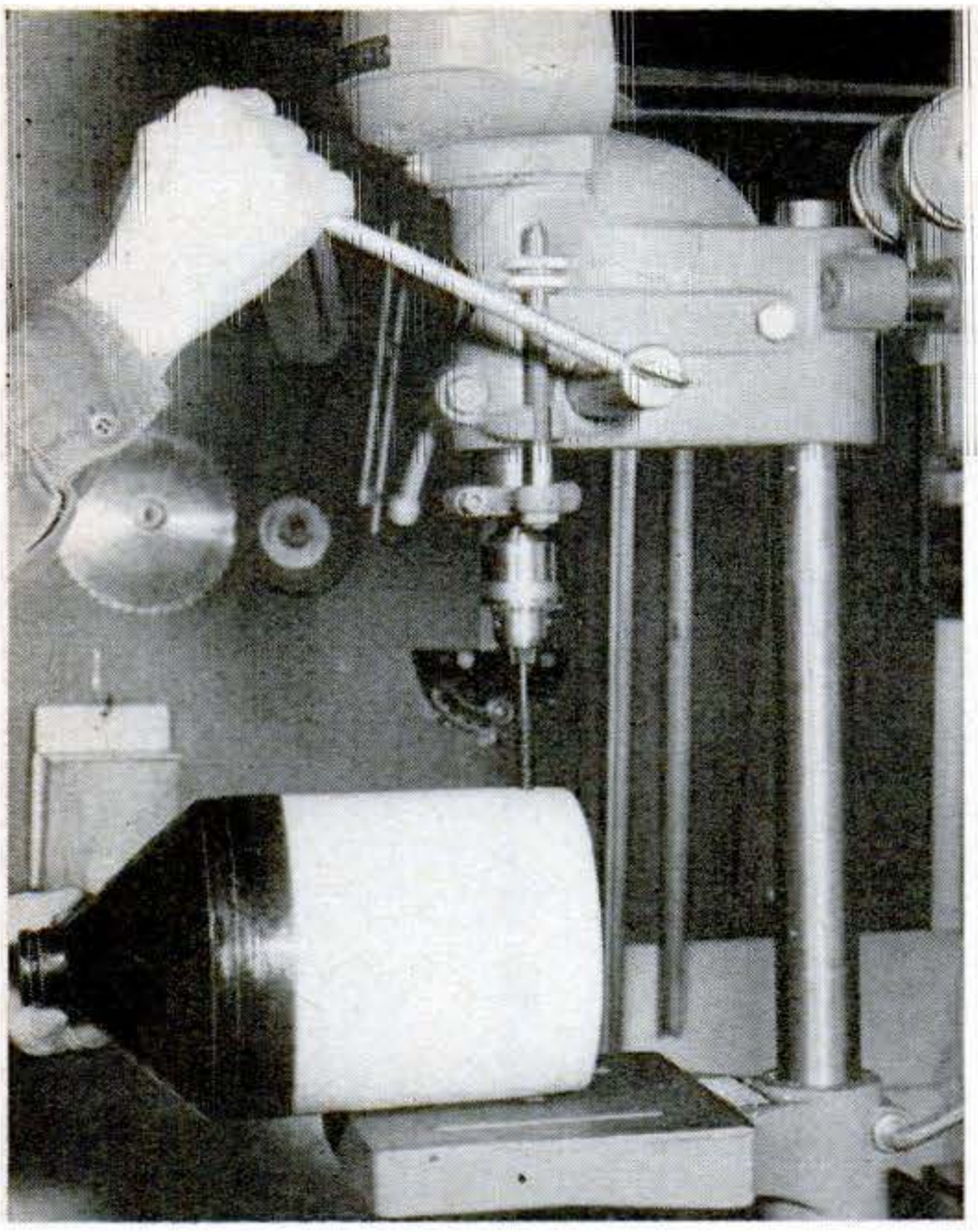
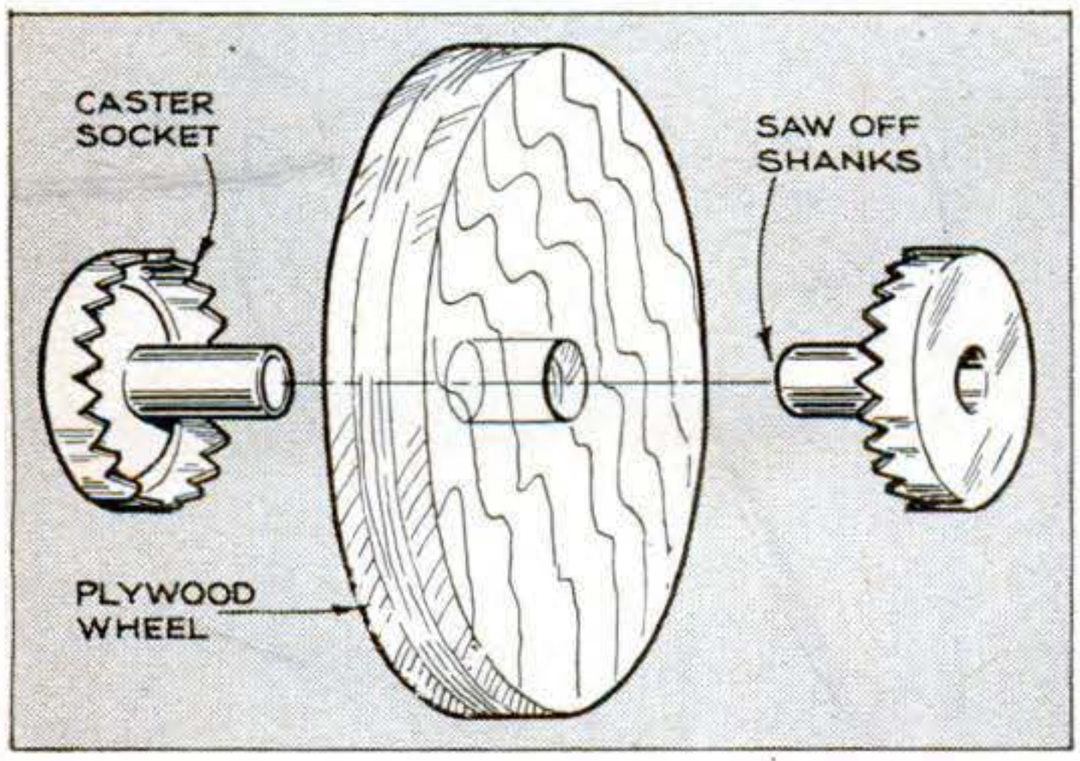


Drilling a Jug for a Lamp

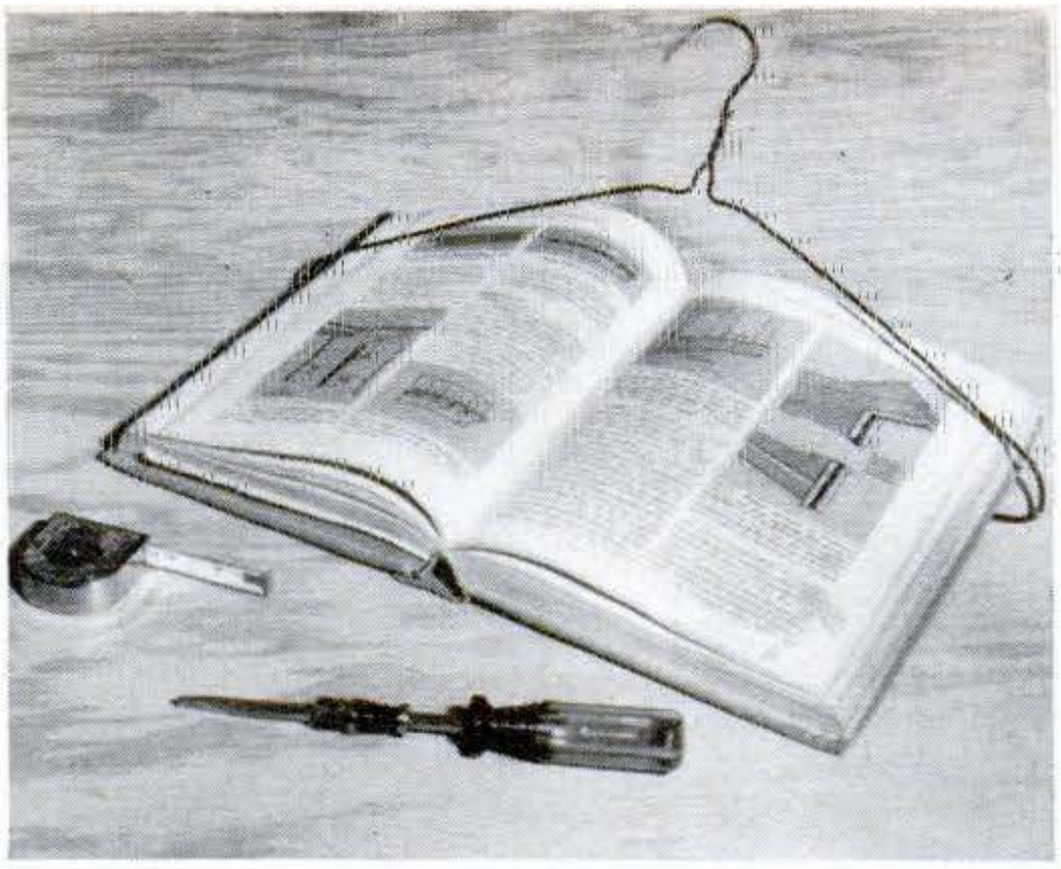
MASONRY drills can be used to make holes in pottery items that are to be converted to lamp bases. A ½" core-type drill works fine on a jug. You'll find it's best to keep pressure even and heavy. Allowing the drill to idle causes excessive dulling. Water can be used as a coolant.—*L. H. Houck, Jefferson City, Mo.*



Sockets Make Wheel Bearings

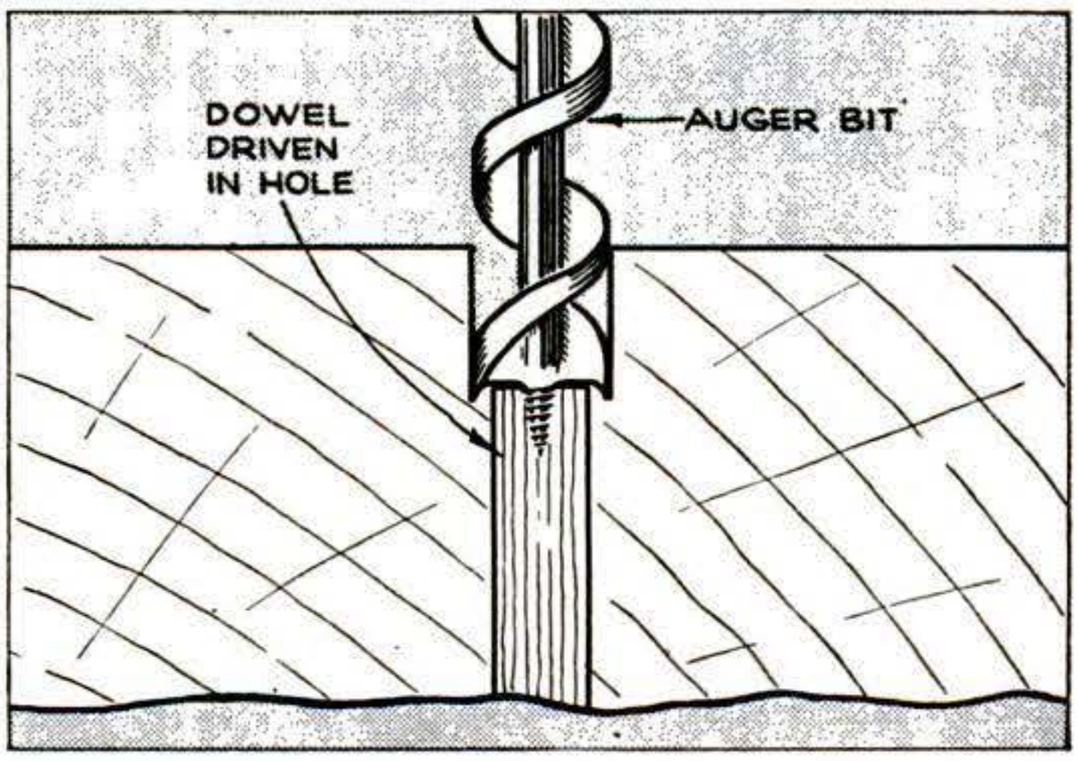
CASTER sockets from an old piece of furniture make excellent bearings for plywood wheels on homemade toys.

Use two sockets for each wheel. Bore the wheel center hole so the socket shanks will fit snugly. Hacksaw off the ends of the shanks to meet, when driven, in the middle of the wheel. Drive in the sockets until the teeth are well set in the wood. —*Harold C. Kimball, Salt Lake City.*



Hanger Keeps Work Book Open

A WIRE coat hanger slipped over a book or magazine like this will keep it open to the desired pages on your workbench while you are working on a project.—*Howard R. Heydorf, Beaverton, Ore.*



How to Enlarge a Hole

WHEN a large hole must be bored over an existing smaller one, the method illustrated will enable you to center the bit accurately. Drive a wood plug or dowel through the hole. This new wood will guide the bit screw through the smaller hole.—*William B. Eagan, Louisville, Ky.*

Crutch Tips Protect Chisels

THE fine cutting edges on your chisels and gouges will last longer if you protect them with rubber crutch tips like this.—*Ken Murray, Colon, Mich.*

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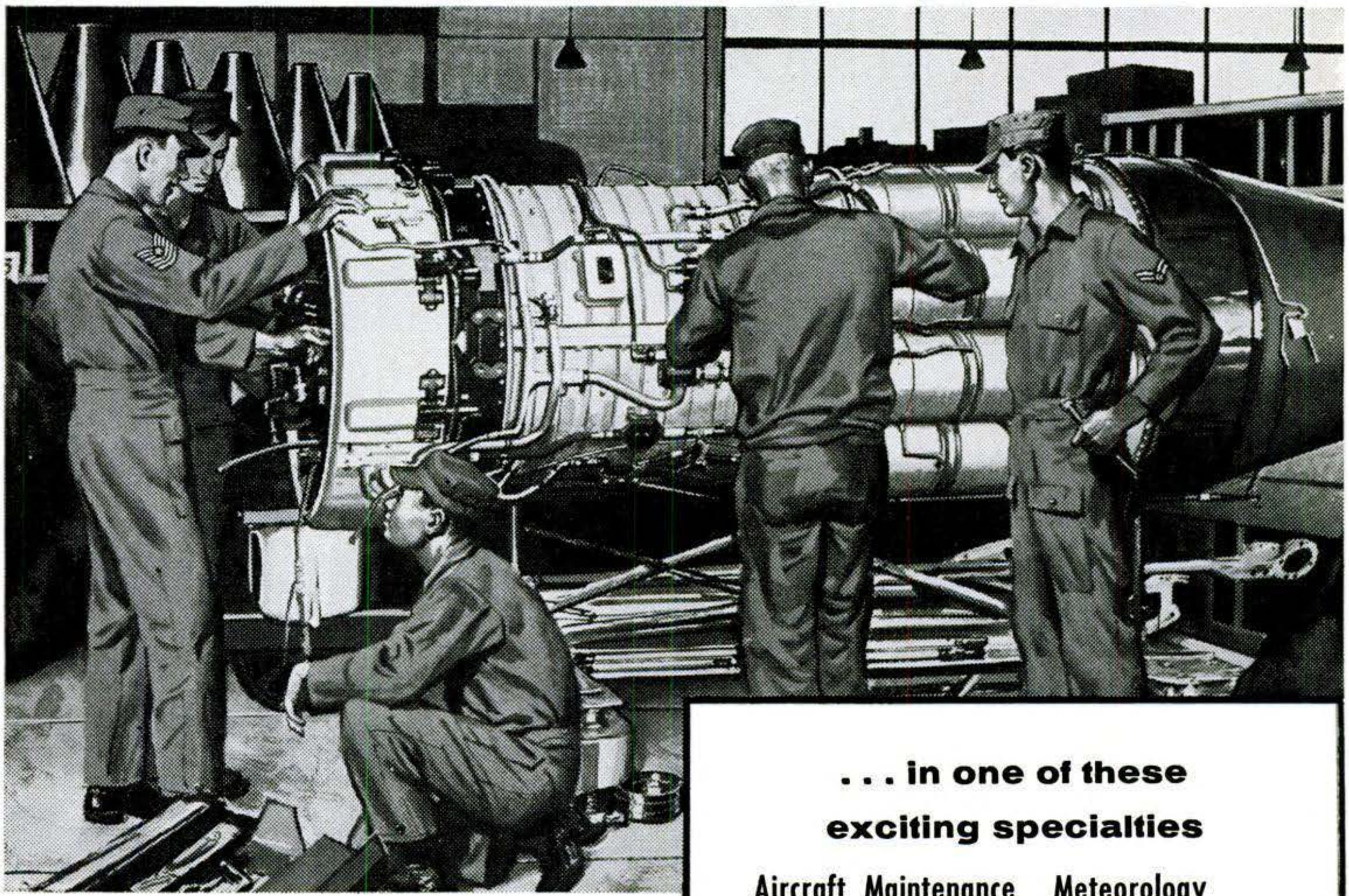
You can train with the U. S. Air Force



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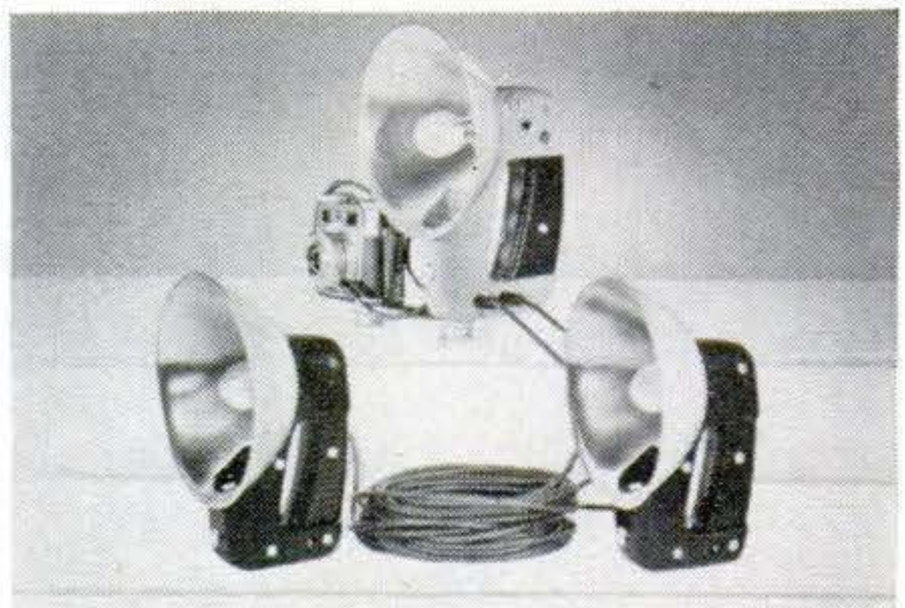
This FLASH makes pictures with a difference

You can make new, exciting flash pictures when you use equipment with versatility designed into it! Read all about it—

The Kodak Ektalux Flash system makes possible a whole new range of lighting effects. It will give you ideas for pictures which never occurred to you before. These two pages show examples. Your photo dealer most likely can demonstrate others.

Kodak Ektalux is the most dependable kind of flash system, too. It uses the B-C (battery-condenser) circuit. The condenser acts as a storage reservoir. It builds up an electrical charge, fires the flash bulb with a full surge every time. You never "miss" a picture because of a weak battery firing the flashbulb late. And you can use six or more extension units for lighting big areas.

Your photo dealer will be glad to demonstrate the Ektalux Flasholder on *your* camera. Then you can see for yourself how many things it can do!



Kodak Ektalux Flasholder—B-C powered, fires 6 or more extension units, each unit having 20-foot cable. Features pistol-grip handle; removable, easy-to-pack reflector; quick load-eject sockets for midget and medium-base bulbs; durable, lightweight. Now only $19.75*. Extension Units, each $9.75. Addition of solenoid trips shutter from Flasholder; Remote Release with solenoid permits exposure control up to 20 feet from camera; Synchro-Switch permits external synchronization if needed.

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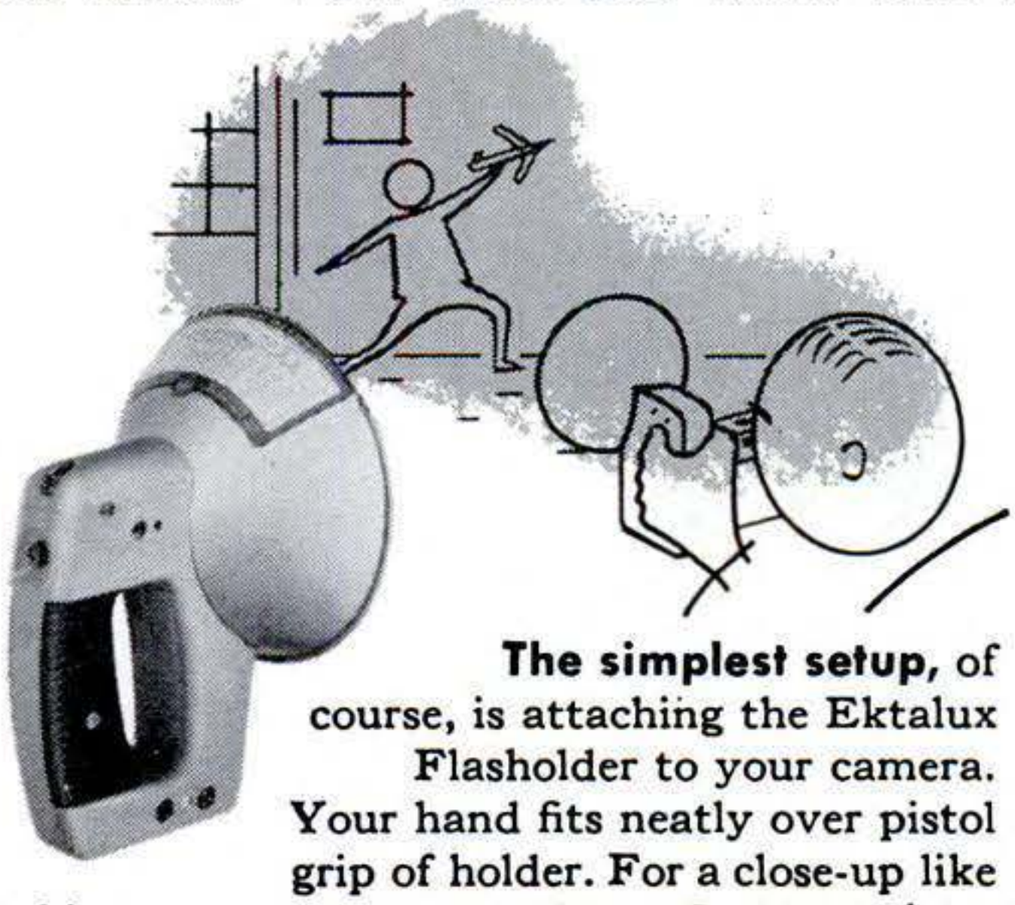
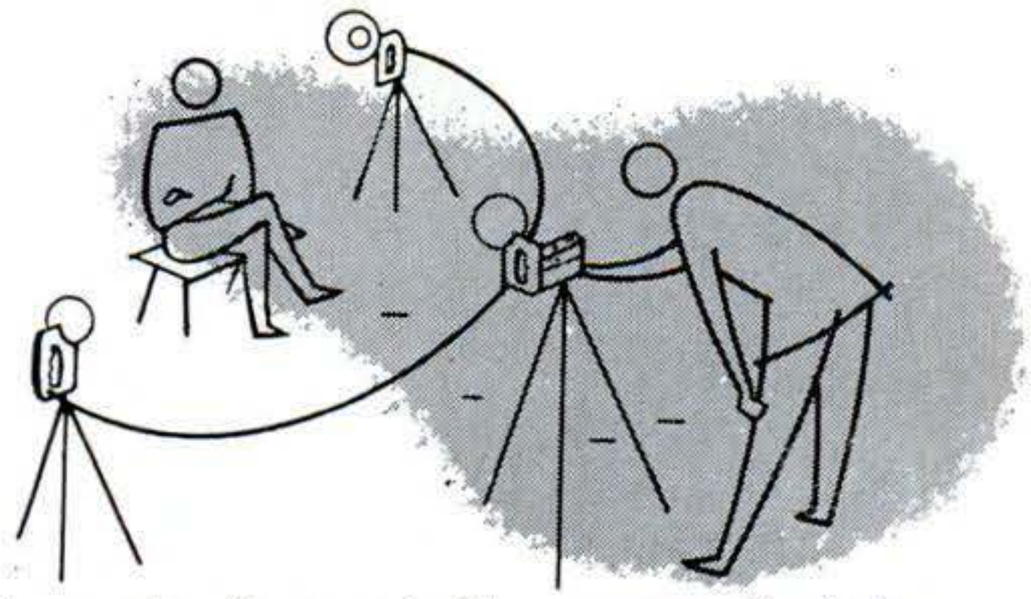
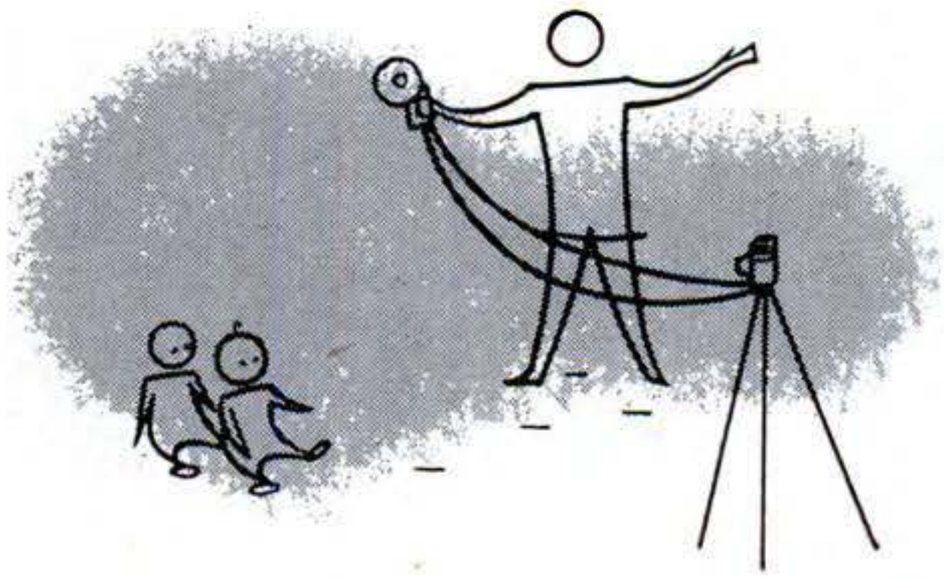
LOOK WHAT YOU CAN DO WITH THE KODAK EKTALUX FLASH SYSTEM



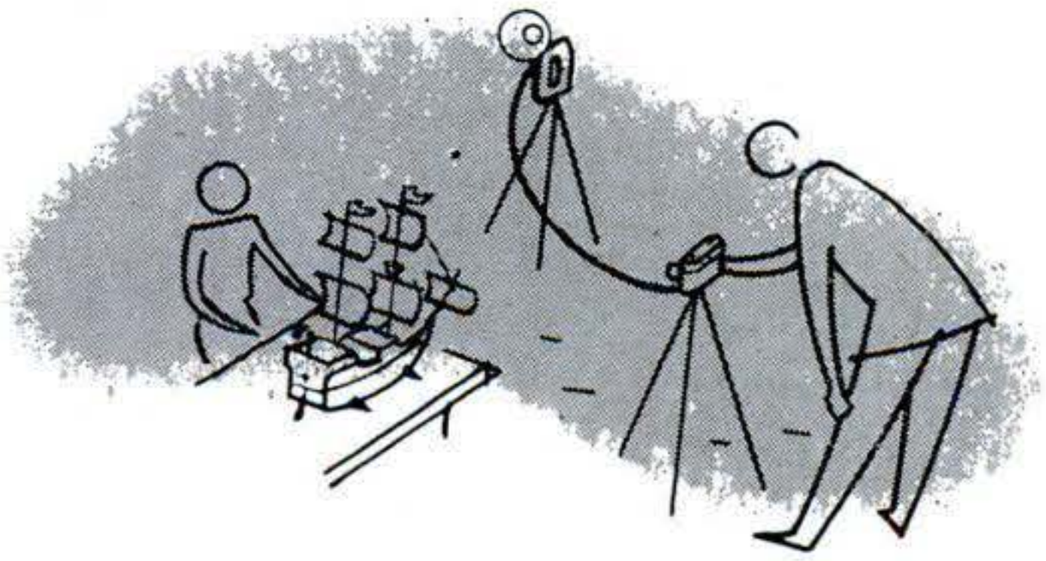
The simplest setup, of course, is attaching the Ektalux Flasholder to your camera. Your hand fits neatly over pistol grip of holder. For a close-up like this, you can use any midget flashbulb (also has socket for medium screw-base bulbs).



For a pleasing portrait, you can attach two Ektalux Extension Units to your Ektalux Flasholder—and fire *all* simultaneously from the camera, exactly timed for perfect results. The Extension Units use the dependable B-C power of the Flasholder. 20-ft. cords allow freedom in placing units.



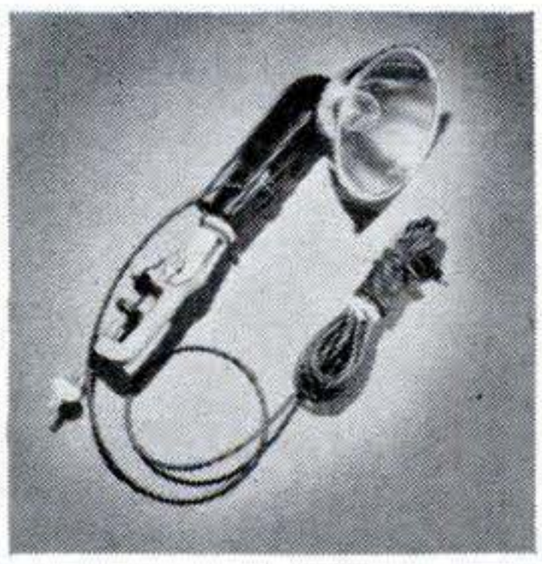
Cute pictures of babies are easy when you divert their attention *from* the camera. Simply hold Ektalux Flasholder away from camera, trip shutter solenoid from Flasholder. You'll catch a more natural pose.



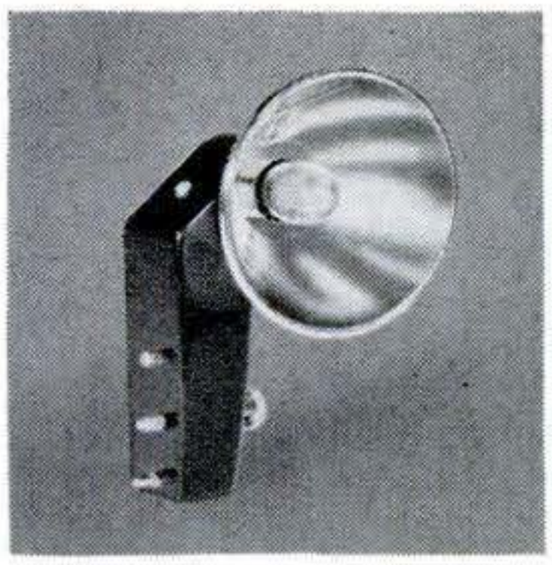
Here's a hobby shot you'll find most useful. Set up the Ektalux Flasholder away from the camera for side-lighting. 20-ft. cord gives great freedom of movement. Fire bulb from camera as you trip shutter.

Other Kodak Flash Equipment for Round-the-Clock Pictures

Kodak B-C Flasholder—Offers dependable B-C power at low cost—only $9.95*. Highly efficient Lumaclad reflector, exposure guide, Flashguard.



Kodak Extension Unit, Model 1—Makes multiple-flash shots easy. 20-ft. cord, support clamp, Lumaclad reflector, Flashguard $11.00 each



Kodalite Midget Flasholder—Uses new low-cost M2 bulbs. For Brownie Hawkeye, Bull's-Eye and Holiday Flash Cameras. Lumaclad reflector. $3.20*

Kodak Standcrd Flasholder—Same size and design as B-C Flasholder but without B-C feature. $7.95*

Kodak B-C Flashpack—Converts two-cell flasholders to B-C power. Uses 22½-volt photoflash battery. $2.95* *Batteries extra

Prices subject to change without notice

Eastman Kodak Company Rochester 4, N. Y.

Kodak
TRADE-MARK

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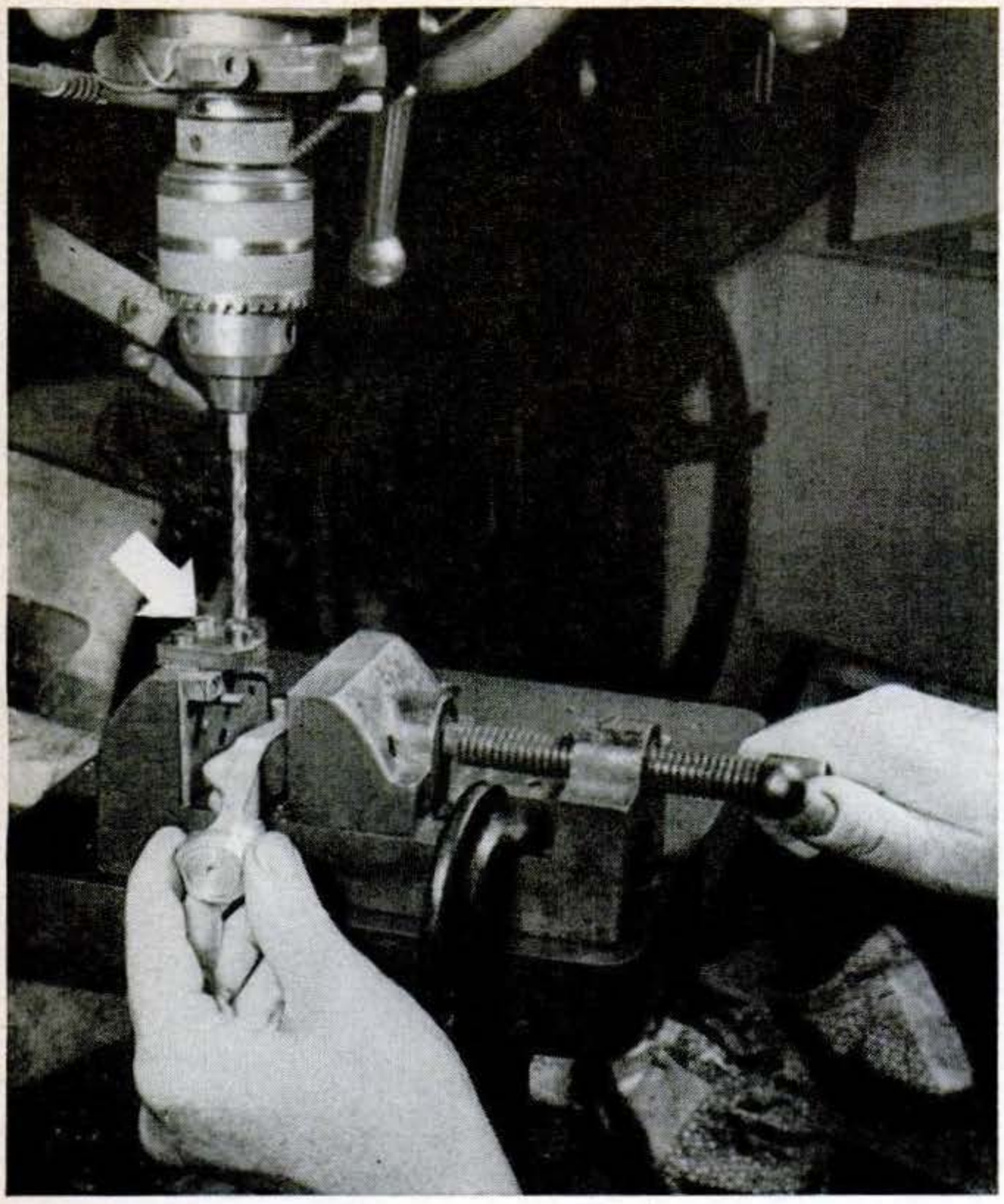
NEW Shop Ideas

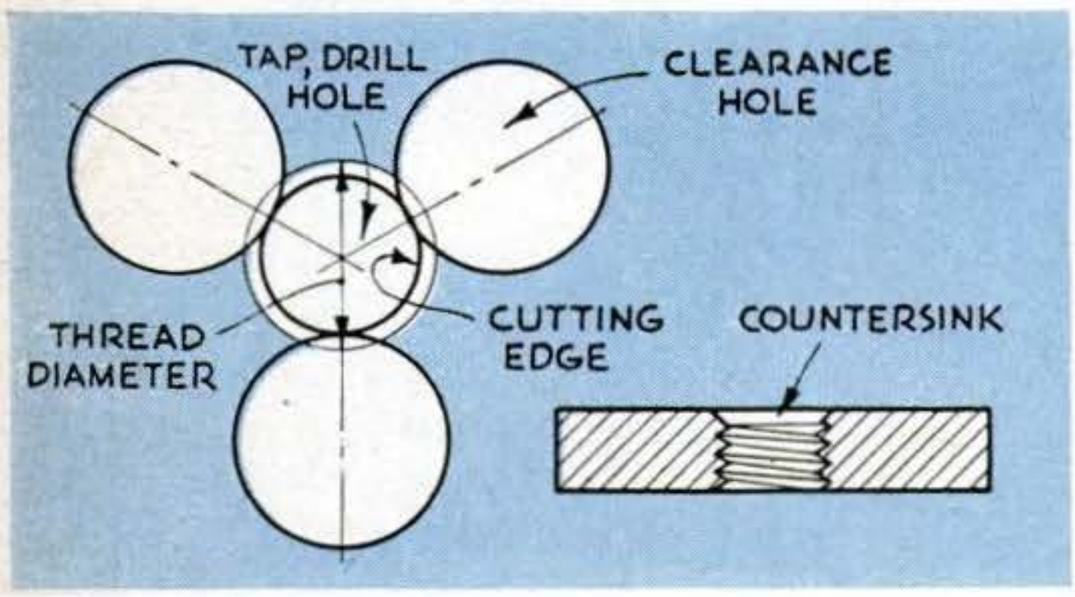


Vise Subs as Drilling Jig. A drill-press vise can double as a jig for precision drilling. Remove the hardened insert on the fixed jaw and drill and tap two holes in the jaw's top surface. With screws, mount a bushing plate (arrow). Make a steel positioning plate to take the place of the insert.

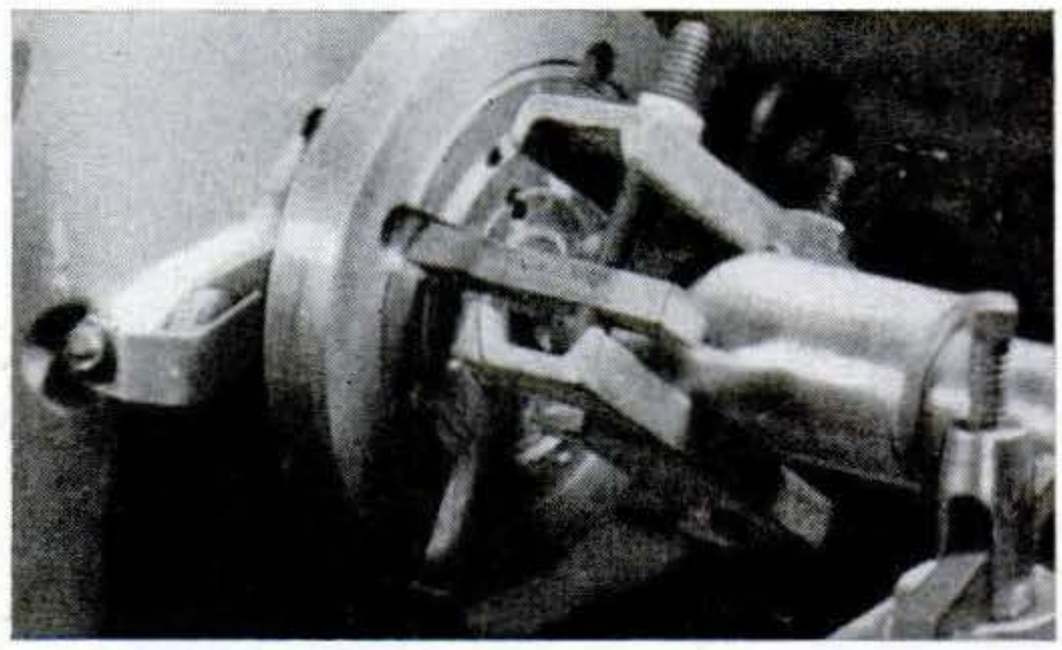
Fit pins into this to locate the pieces for repeat operations. When the vise is positioned and clamped to the table, work can be inserted and removed simply by backing off the movable jaw.—*John McGuckin, Ridgewood, N. J.*

Tap Makes Emergency Dies. Next time you need a die not in your own assortment, you needn't drop work until the stores open. If you have a tap the desired size, you can make the die.

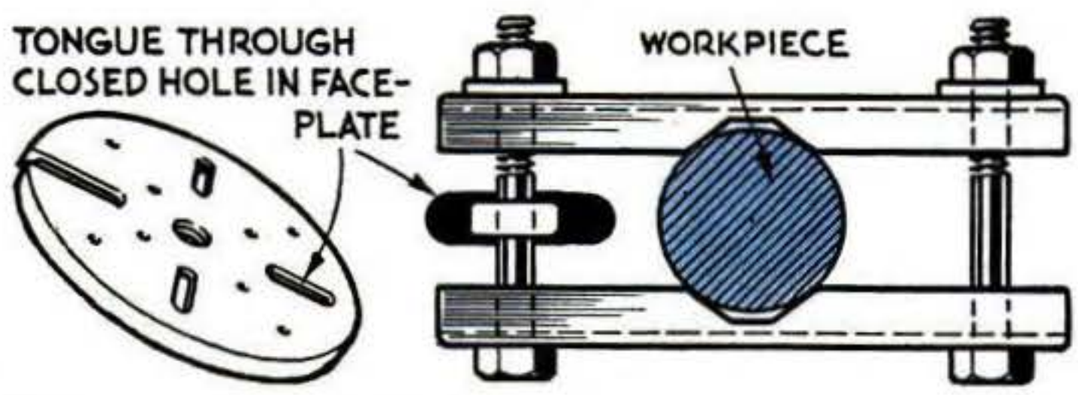
Use the tap to cut threads in a steel disk. Then countersink one side for starting the thread, and drill three clearance holes 120° apart. Use the die as it is for soft metals. Harden and temper it for threading steel.



Ribbed Mat Sorts Parts. When you take apart a small mechanism, lay out the parts on a ribbed rubber floor mat. They will stay in place in the order in which they were removed, making the reassembly easier.—*Harvey Muller, Danboro, Pa.*



Dog Has Big Bite. Large-diameter stock may be too big a mouthful for the lathe dogs on hand. This one is quickly made from two pieces of channel iron. A V cut in the center of each grips the work, which is clamped with two bolts. The tongue, a short steel bar drilled to fit easily on one bolt, is inserted in a closed slot in the faceplate to drive the dog.—*J. M. Finn, Pittstown, N. J.*



 Please turn to page 238 for more shop ideas

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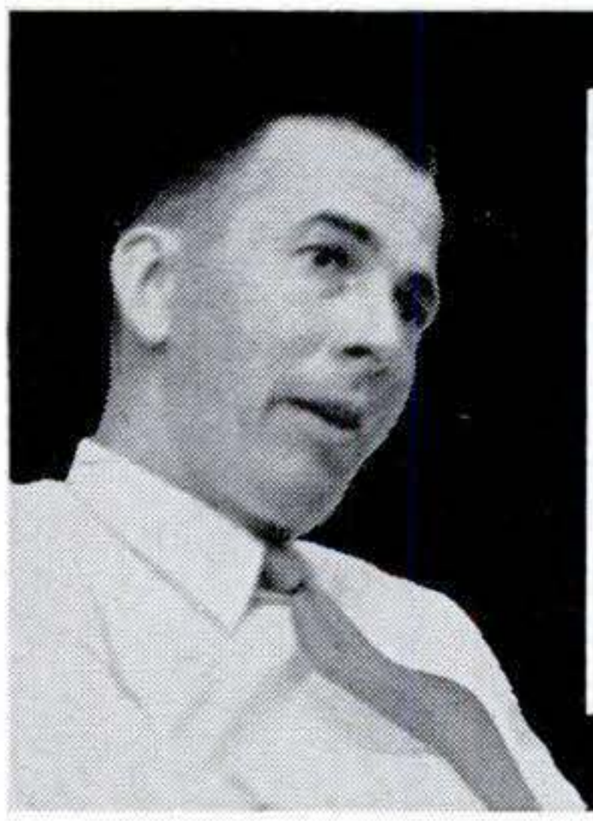

"We got a big kick out of designing this new Chevrolet, and you'll get an even bigger one out of driving it."

—says Ed Cole, Chevrolet Chief Engineer

IT ONLY happens once in an engineer's lifetime—when a company like Chevrolet hands you a blank sheet of paper and says: "Design us a car—from scratch." But what a wonderful sensation it is to plan a car from the very beginnings, so that it is *right*, all down the line.

That's the chance we were given with the 1955 Chevrolet . . . and we started right from fundamentals with a new frame (*lighter but 50 per cent more rigid*), new bodies (*quieter, bigger inside, with 18 per cent more glass all around*), new spherical-joint front suspension (*softer flexing and uniquely self-adjusting*), outrigger rear springs (*for greater stability on curves*), even an Anti-Dive braking control (*to check that "nosing-down" in front when you apply the brakes suddenly*).

We came up with three new engines—two new versions of the "Blue-Flame" 6's and a 162-h.p. "Turbo-Fire V8" that has the shortest stroke in its field and an 8 to 1 compression ratio. We added a Touch-Down Overdrive transmission, and a smoother Powerglide as extra-cost options, and a sturdier standard shift—even provided a 12-volt electrical system for more reserve power and a High-Level ventilation system that draws in cleaner, fresher air.

We made so many improvements they can't even be *listed* here—and we got a big kick out of it. But I know you'll get an even bigger kick when you slide behind the wheel of a car that is blueprint-new—from the tubeless tires right on up.

You can't know how advanced the '55 Chevrolet is until you drive it, so why not call your Chevrolet dealer today and have him set up a ride for you? . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

More than a new car . . . a new *CONCEPT* of low-cost motoring!

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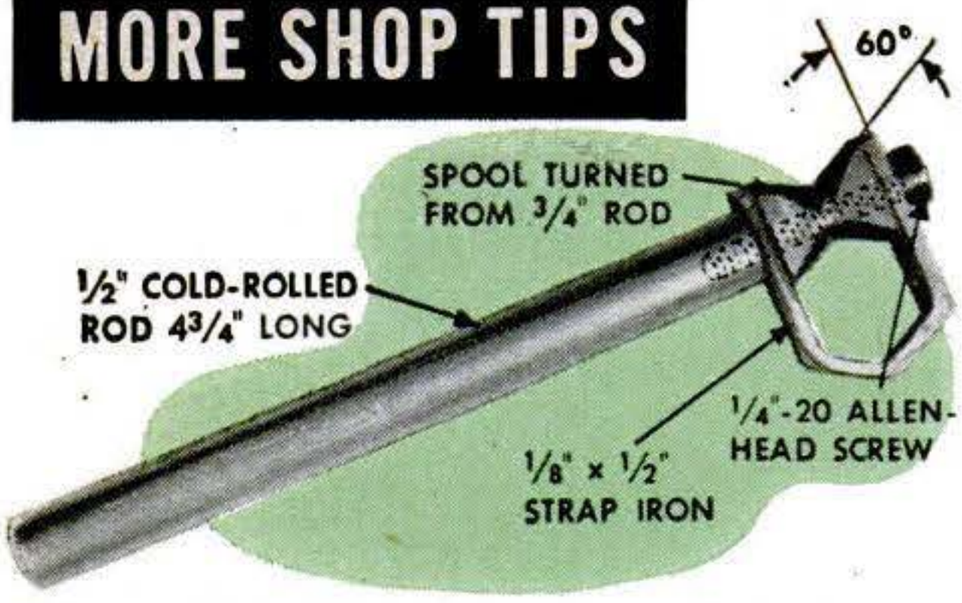
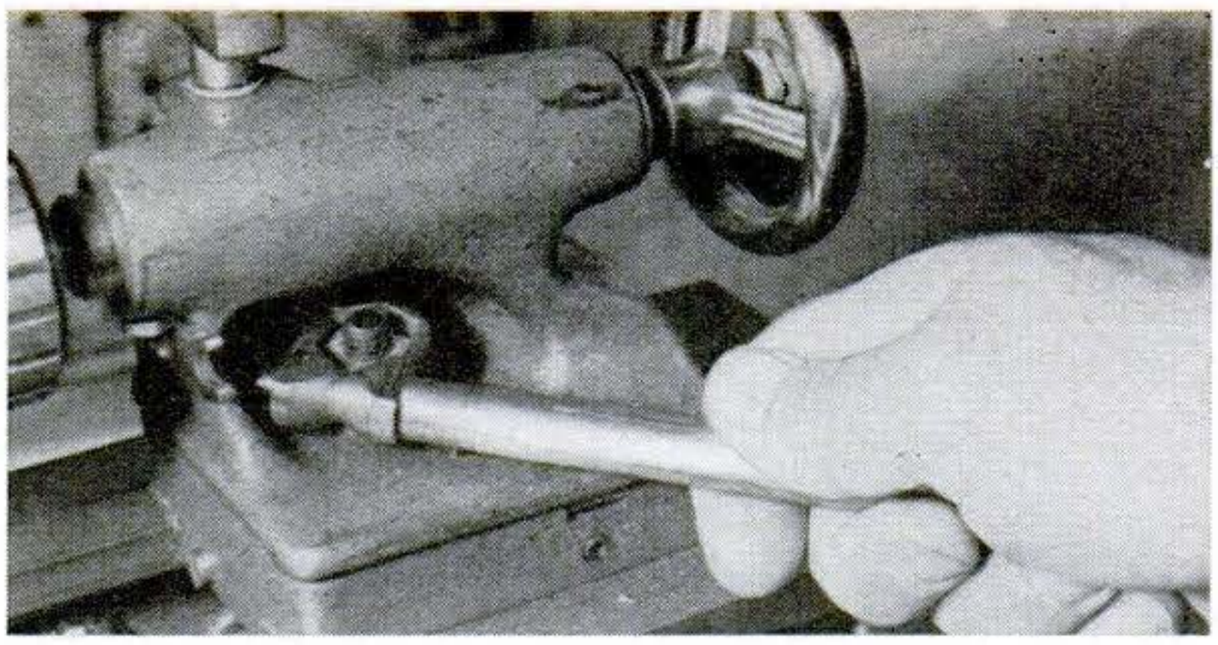
MORE SHOP TIPS

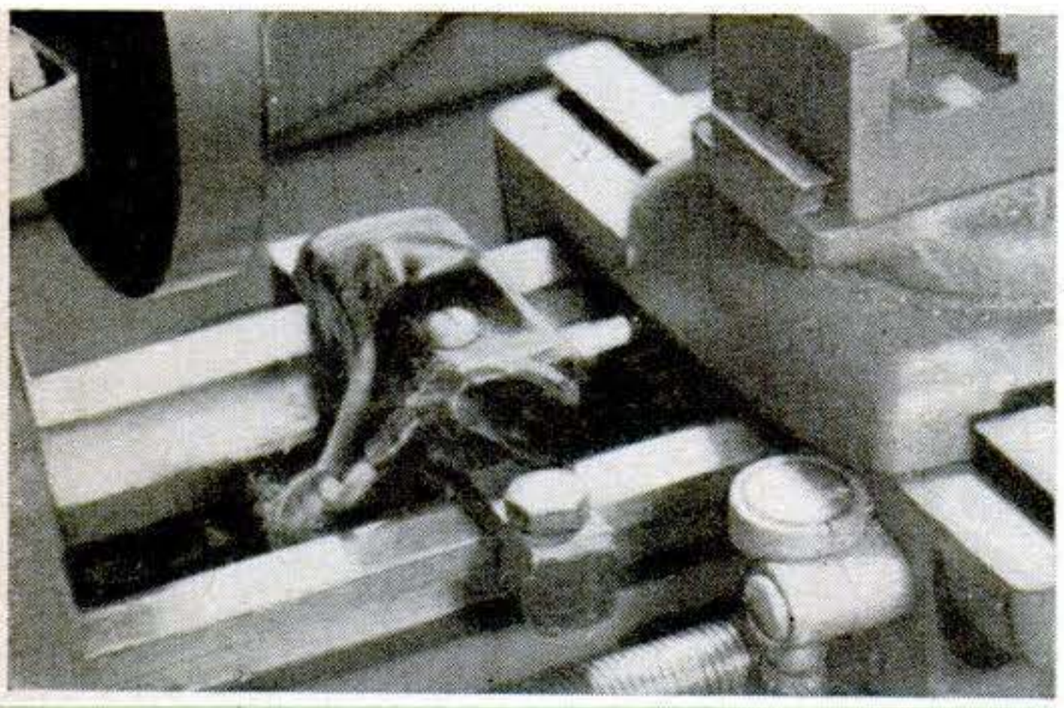


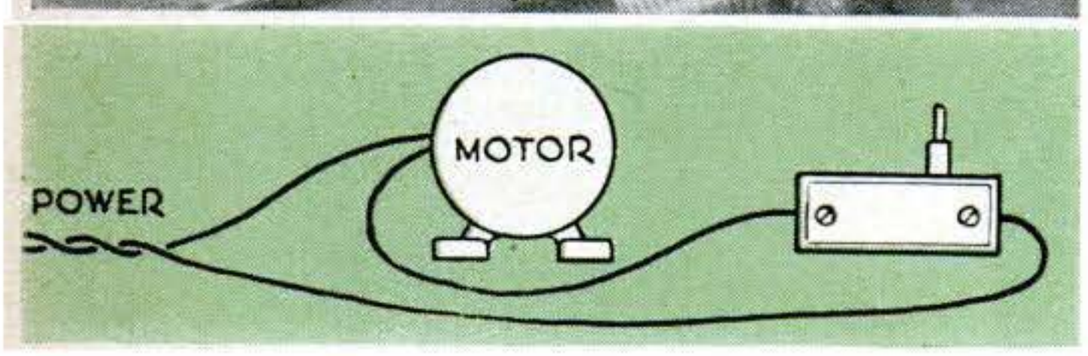


Box Wrench Is Turning Job. Wrenches for hex nuts can be made in all sizes on your lathe. Turn a tapered spool to a double 60° taper, making it as long as the width across nut flats. Make the handle from ½″ cold-rolled rod, drilling and tapping one end for a ¼″-20 cap screw.

Drill one end of a short length of strap iron and fasten it between the handle and the spool with the cap screw. Bend it tightly around a hex nut held against the spool to spot the second hole.

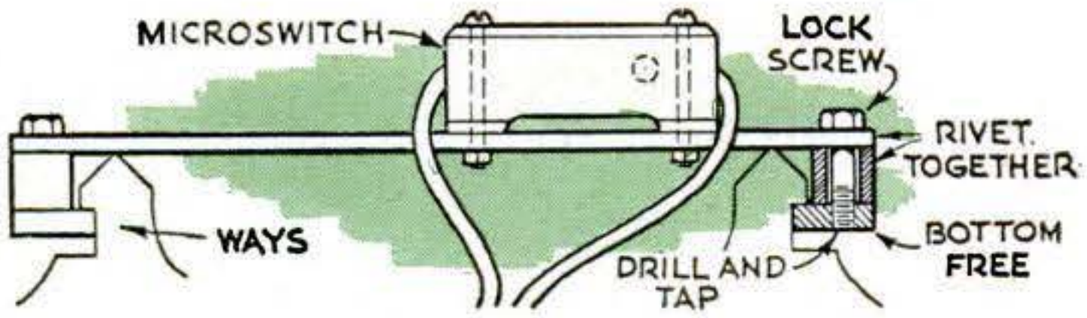
File the strap ends flush with the spool and reassemble. Its offset makes this wrench especially useful around machines.—*John M. Avery, Dexter, N.Y.*





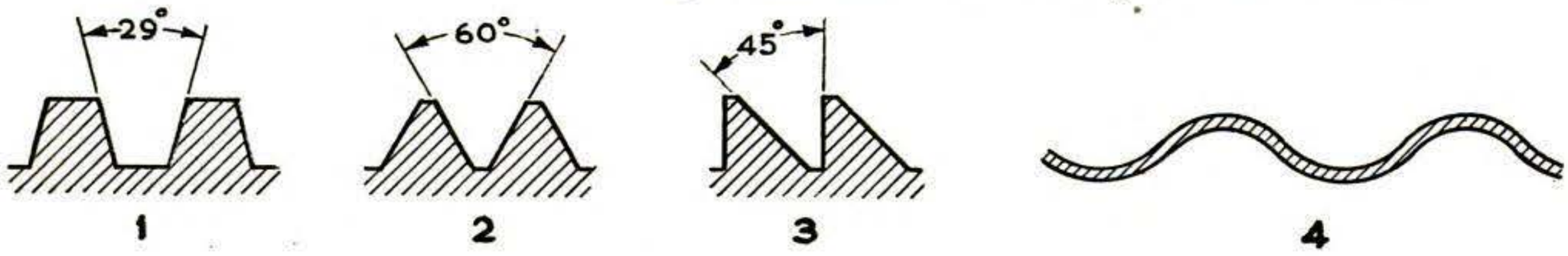
Snap Switch Halts Lathe. By attaching a normally-on snap switch to a crosspiece on the lathe bed, you can leave the machine untended to make long cuts with power feed. As the carriage touches the switch button, it shuts off the motor, ready for the operator to start the next cut.

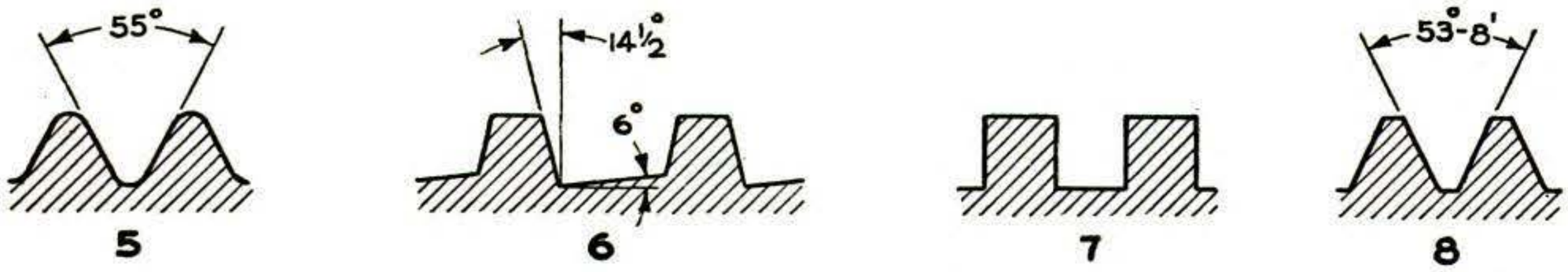
Use a switch with a button or lever that permits slight overtravel. Two clamp bolts and lugs on the crossarms, as shown in the drawing below, make it possible to position the switch anywhere on the lathe bed.



Shop Screw Quiz

Score your shop knowledge by naming these screw threads. If you can guess four out of the eight, you're doing well. Answers are upside down below.





1. Acme; 2. American standard; 3. Buttress; 4. Electric lamp socket; 5. British standard Whitworth; 6. Dardelet self-locking; 7. Square; 8. Löwenherz (metric).

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NOW Toolkraft Presents the Revolutionary New

Darra-James

Tilting-Arbor Band Saw

DOES WORK NOT POSSIBLE ON ORDINARY BAND SAWS

Angle of tilt can be changed while sawing. Table stays flat.

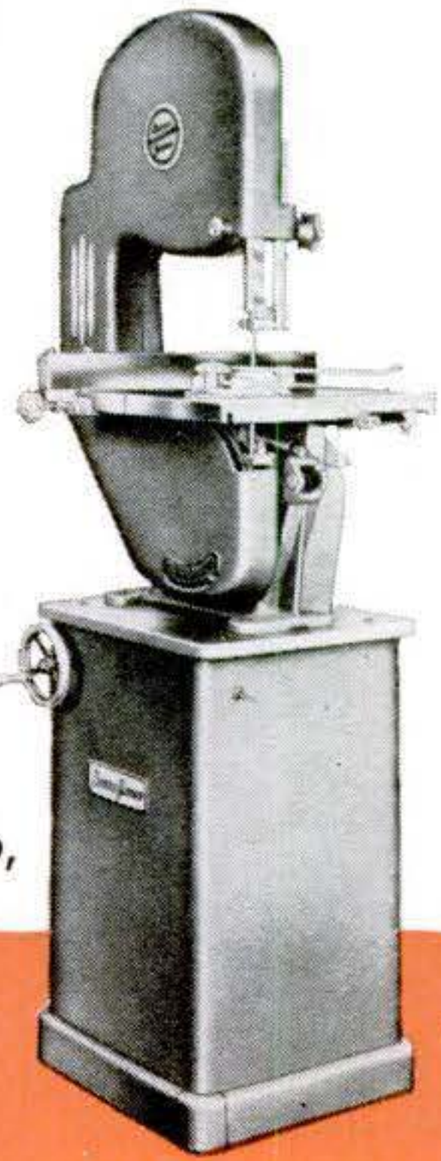
Capacity
15″ at 45°
12″ at 90°

MODEL 512 ONLY
$129.50

- ★ Tilts to 45°
- ★ Balanced Wheels
- ★ All Ball Bearings
- ★ Many Accessories

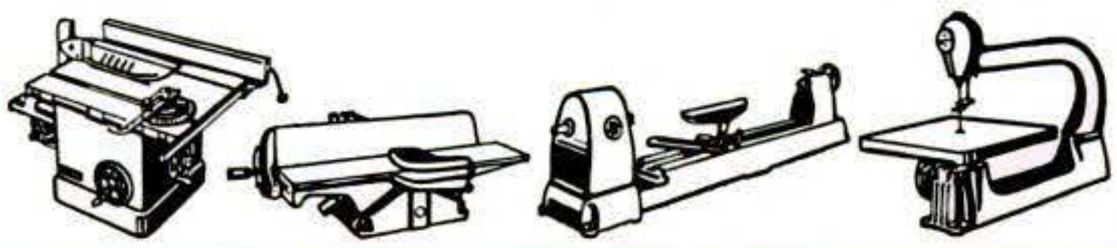
Amazing: You will be amazed to see The Darra-James Model 512 go through its paces. Combines several operations in one. Cuts wood, metal or plastic. Blade guides with ball bearing blade-backing wheel stay in adjustment while arbor is tilted. Many other features too numerous to list here.

ASK YOUR POWER TOOL DEALER OR WRITE TOOLKRAFT FOR COMPLETE SPECIFICATIONS



AVAILABLE ACCESSORIES INCLUDE RIP FENCE, MITER GAGE, FLOOR STAND, VARIABLE SPEED ATTACHMENT

25 Other Darra-James Power Tools



Darra POWER TOOLS James

toolkraft CORPORATION
SPRINGFIELD MASS

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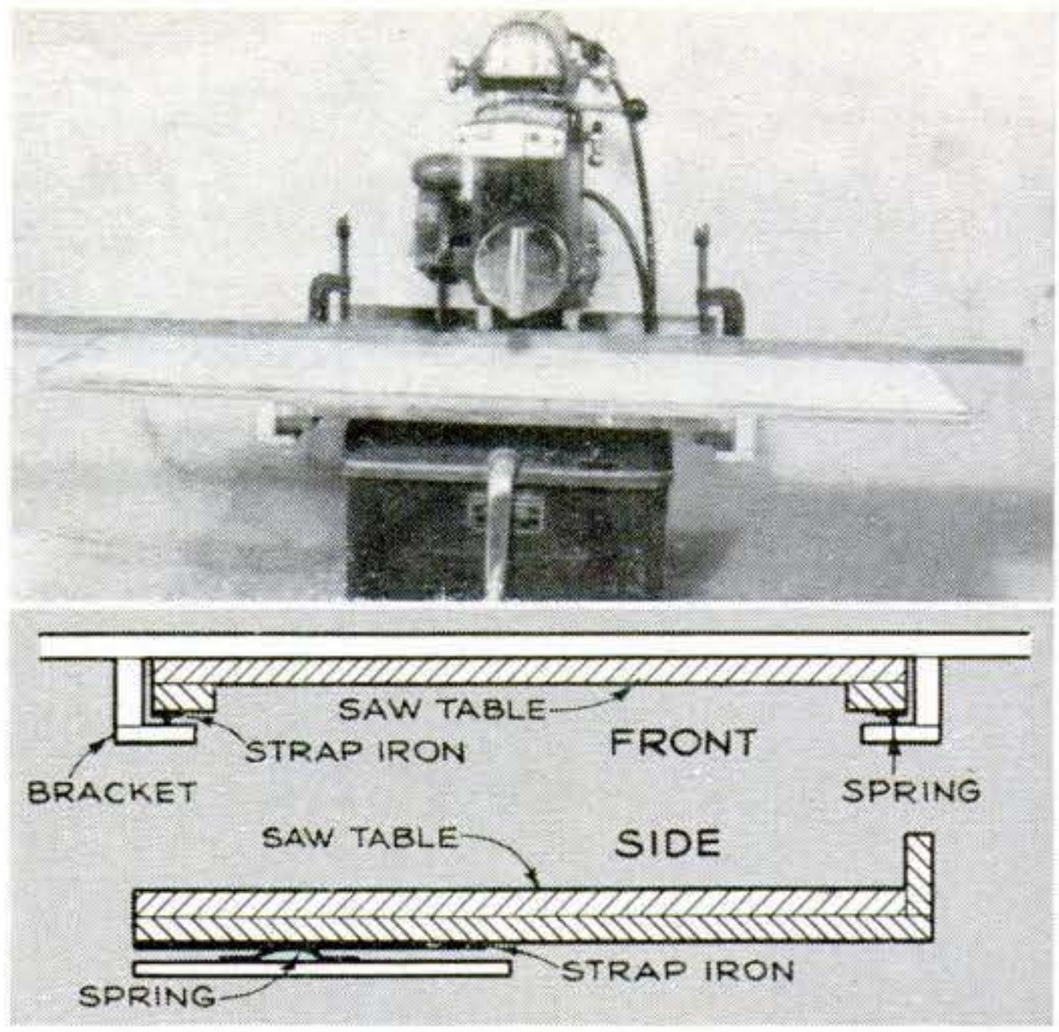
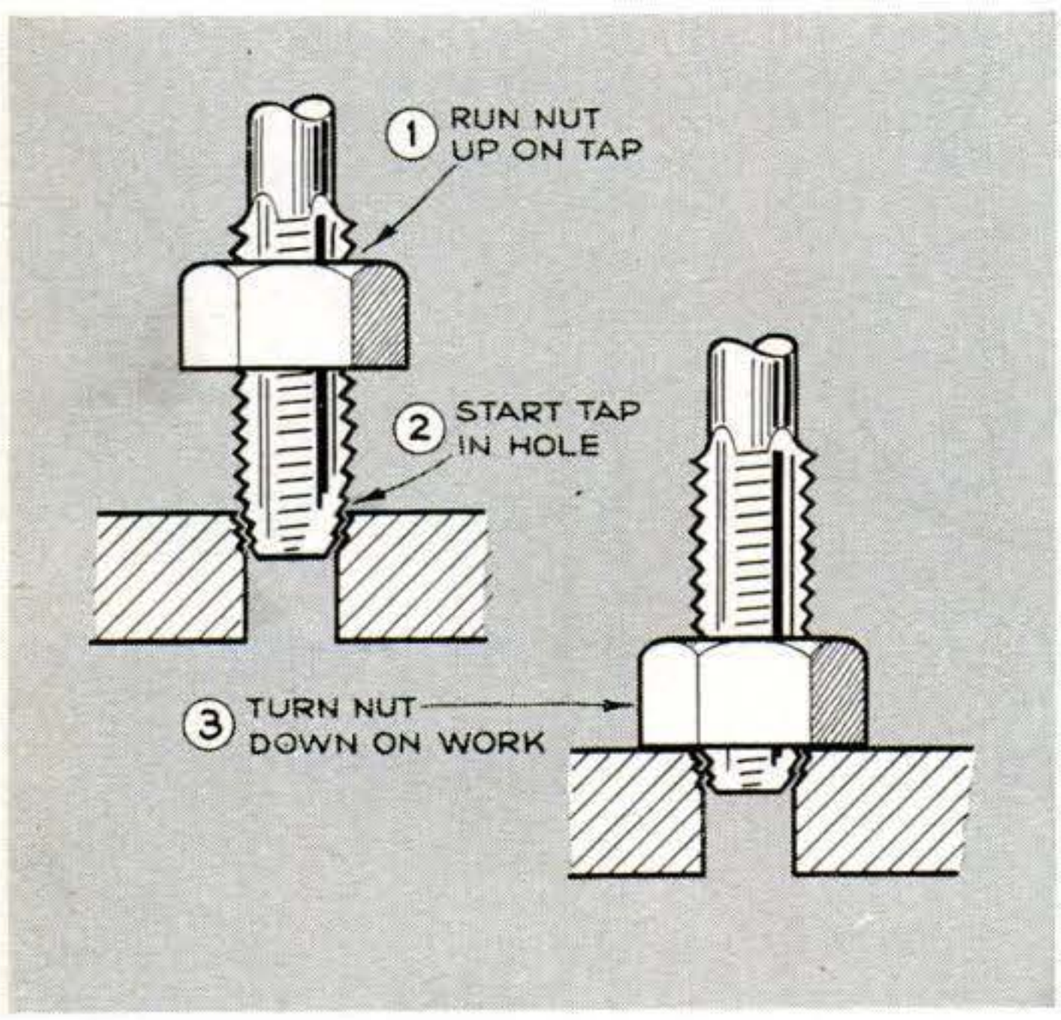
Extensions Add to Radial-Saw Capacity and Protect Table

Two spring clips let you snap this extension over the table of a radial saw, adding to its capacity and saving the table from being chewed up by repeated passes of the saw blade over it. A long fence, mounted independently, makes cuts more accurate.

Make the table extension from a piece of ¾″ plywood about 4′ long and wide enough to set flush with the saw table. Fabricate two L-shaped brackets from strips of 1″ pine and ½″ plywood, and screw them to the underside of the extension. Screw a flat sash-balance spring inside each bracket to keep the extension from tipping, yet permit easy removal. Fasten two strips of ⅛″ strap iron under the saw table for the sash springs to bear against.

Cut a 6′ length of straight-grained fir and face one edge with hardwood to make the fence. Clamp it to the saw table and cut a V notch at about the midway point where the saw blade passes over it. Countersink the screws so the face can be jointed to keep it straight.—*Francis Munson, Los Angeles.*

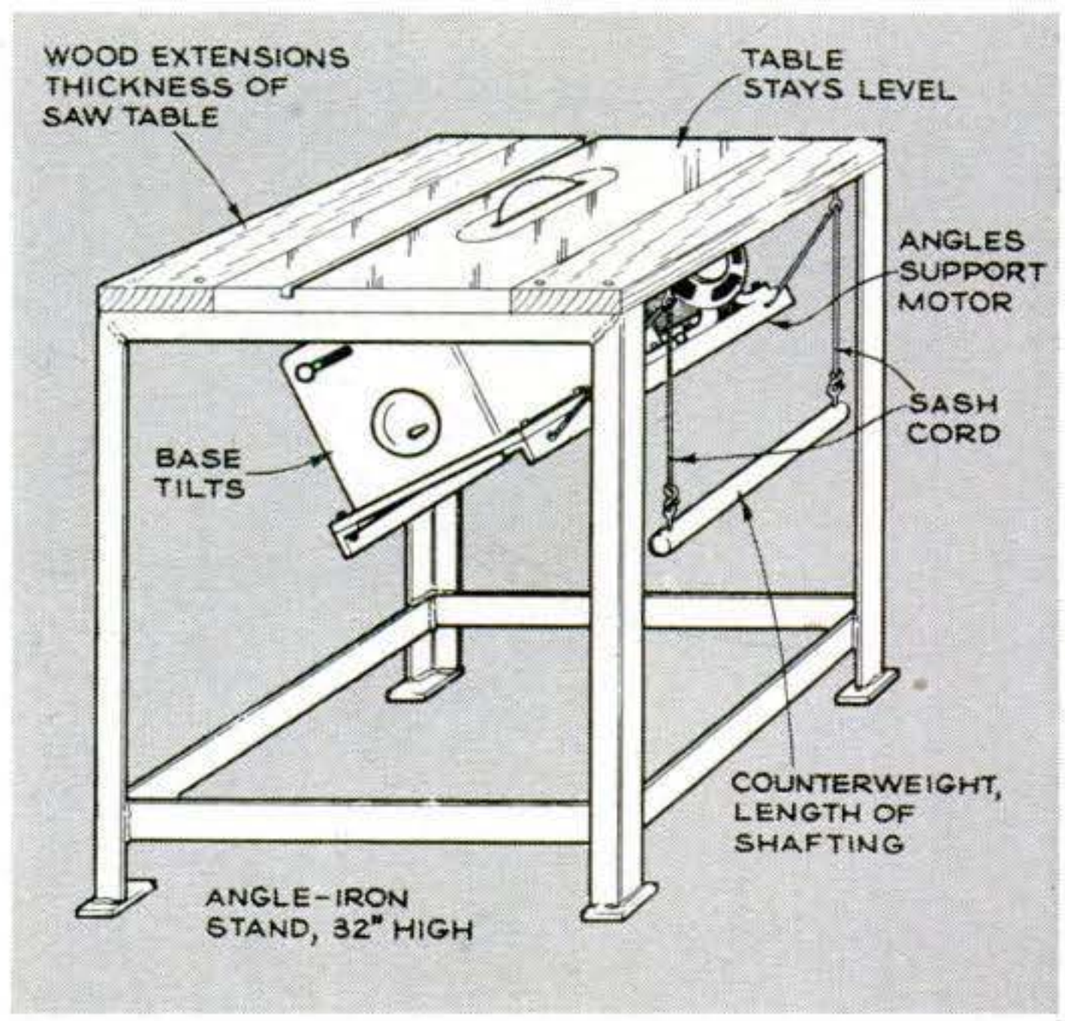




Nut Guides Tap at Right Angle

HAND tapping is often inaccurate, but here's a way to keep the tap at right angles to the work.

Run a commercial nut of the same size well up on the tap. Start the tap in the hole carefully, but go only far enough so the first threads take hold. Then, keeping the tap engaged, turn the nut down cautiously against the surface with a wrench; as it bottoms, it will draw the tap straight. Take care not to strip the starting threads. Keep the nut bearing against the work by moderate wrench pressure as you turn the tap in farther.—*Ralph E. Krogh, Detroit.*



Stand Modernizes Table Saw

OWNERS of saws with tilting tables know the inconvenience of working uphill or downhill when cutting bevels. But with the table attached to an open stand, you'll never have to tilt it uncomfortably. You can swing the saw's base while the table remains level.

Bolt two lengths of angle iron to the saw base, extending them beyond the saw at the rear to support the motor. Balance the base with a counterweight hung on two sash cords, to pull it in the direction of tilt. This relieves the tilt lock of strain when the base is set at an angle.—*John Kretzschmar, Monsey, N. Y.*

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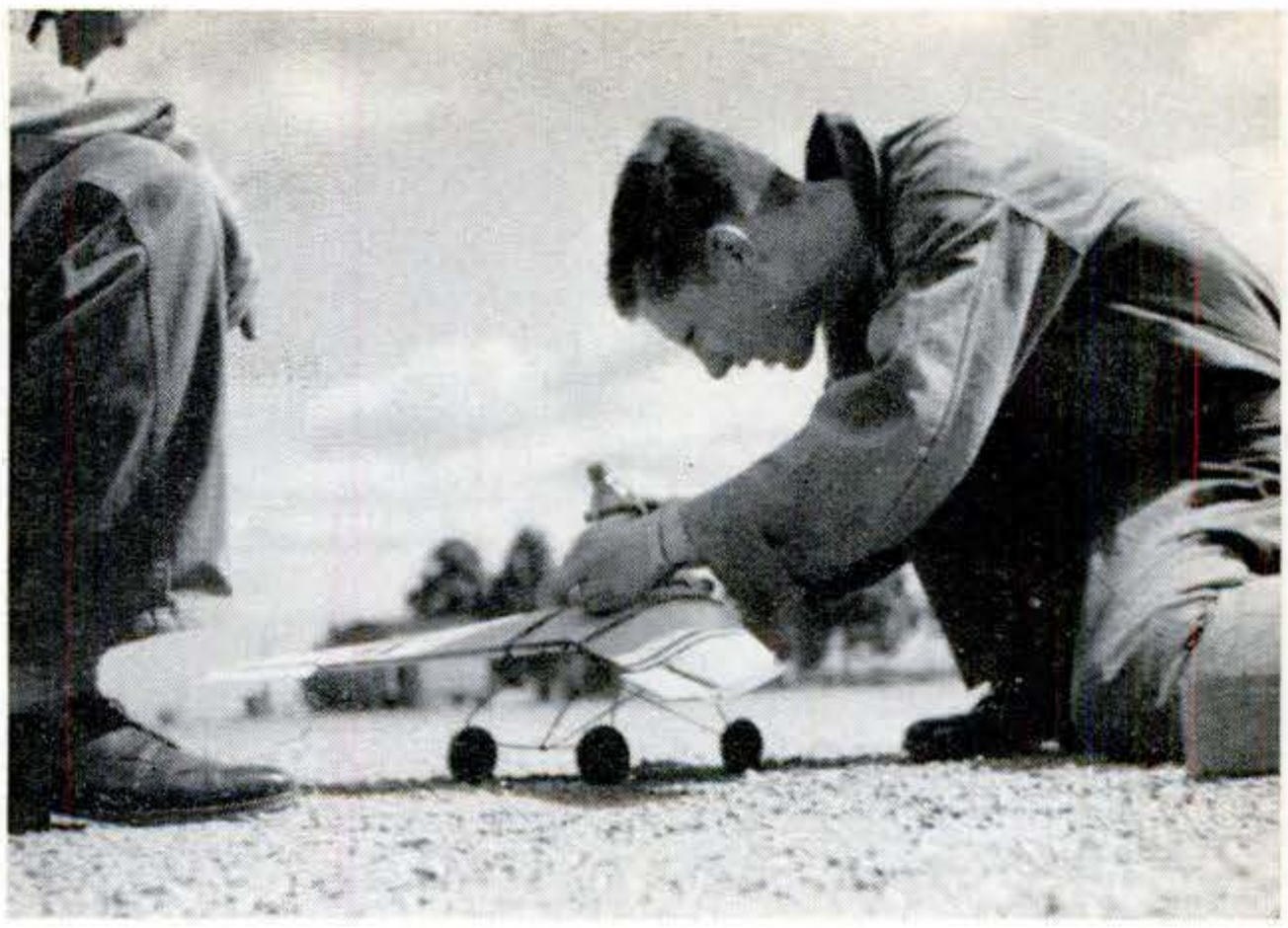
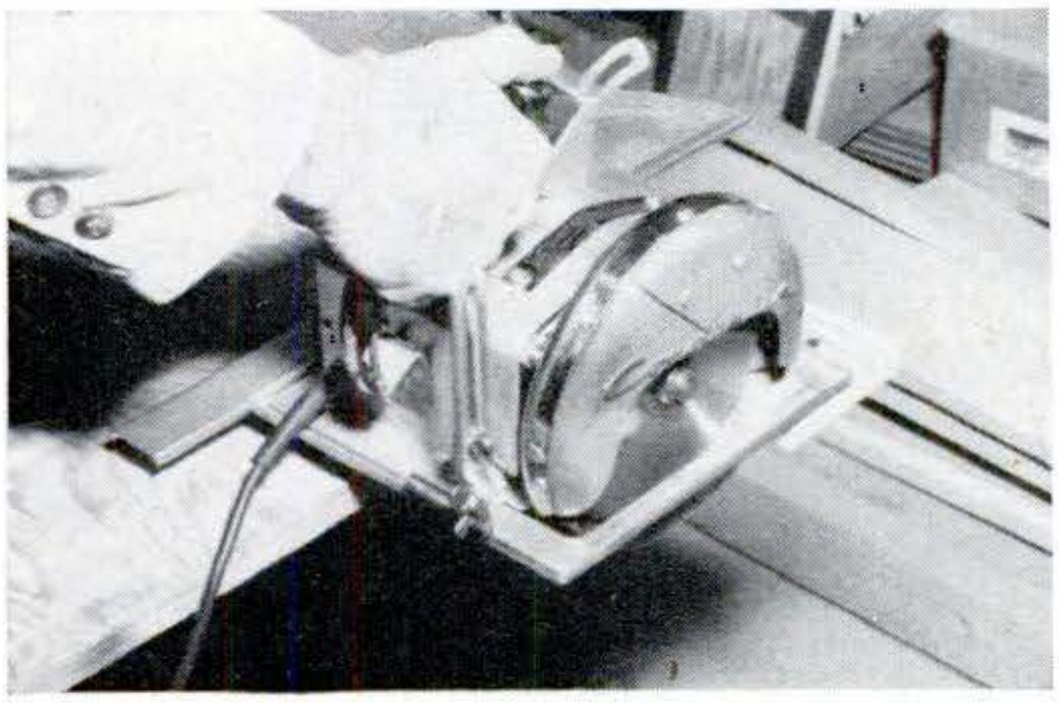
CRAFTSMEN AT WORK



Four-Control Flying Wing. The excellent structural design of Cliff Thomsen's three-foot flying wing, swept back 30 degrees, wrings extra-high speed out of its Class A (.19 cubic inch) model diesel engine when Thomsen sends it aloft on tethered flights. Its four controls are push-pull wires encased in aluminum tubing. The flying wing's unusual stability makes it possible for even a novice to fly it successfully.



Saw Short-Cuts PSM Plans. An article in this magazine on building a 6″ portable electric saw from junked vacuum-cleaner parts (April '52, p. 184) hit B. H. Ingram where he lives in Grand Island, Nebr. Never one to make a hard job out of an easy one, Ingram fitted his saw with a door handle from an old Hudson and jigsawed the quadrant and depth adjustment from airplane channel. Including a handy case and two blades, Ingram built the efficient little outfit at a cost of less than $7.

Safe Tractor for Small Tykes. A spring-loaded clutch pedal disengages the 1½-hp. engine of this yard tractor when the young man at the wheel feels he's done a full day's work. At the same time the worm-and-gear drive locks the rear power wheel, preventing coasting on the steepest grades. Top running speed is two m.p.h. Builder Leroy M. Beckett of Manchester, Conn., has carried safety precautions even to the tall stack which he put on to spume exhaust fumes over his son's head.

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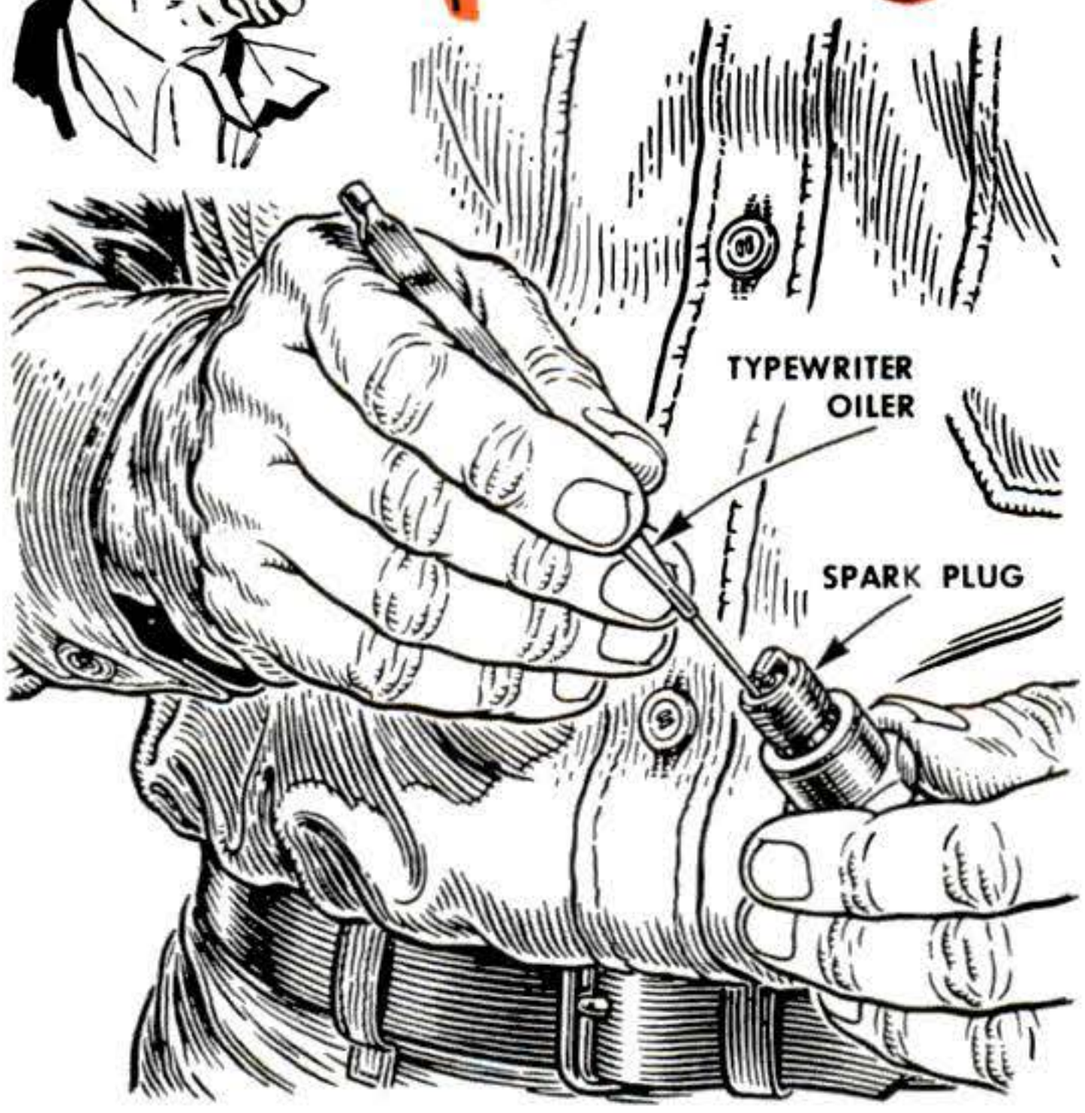
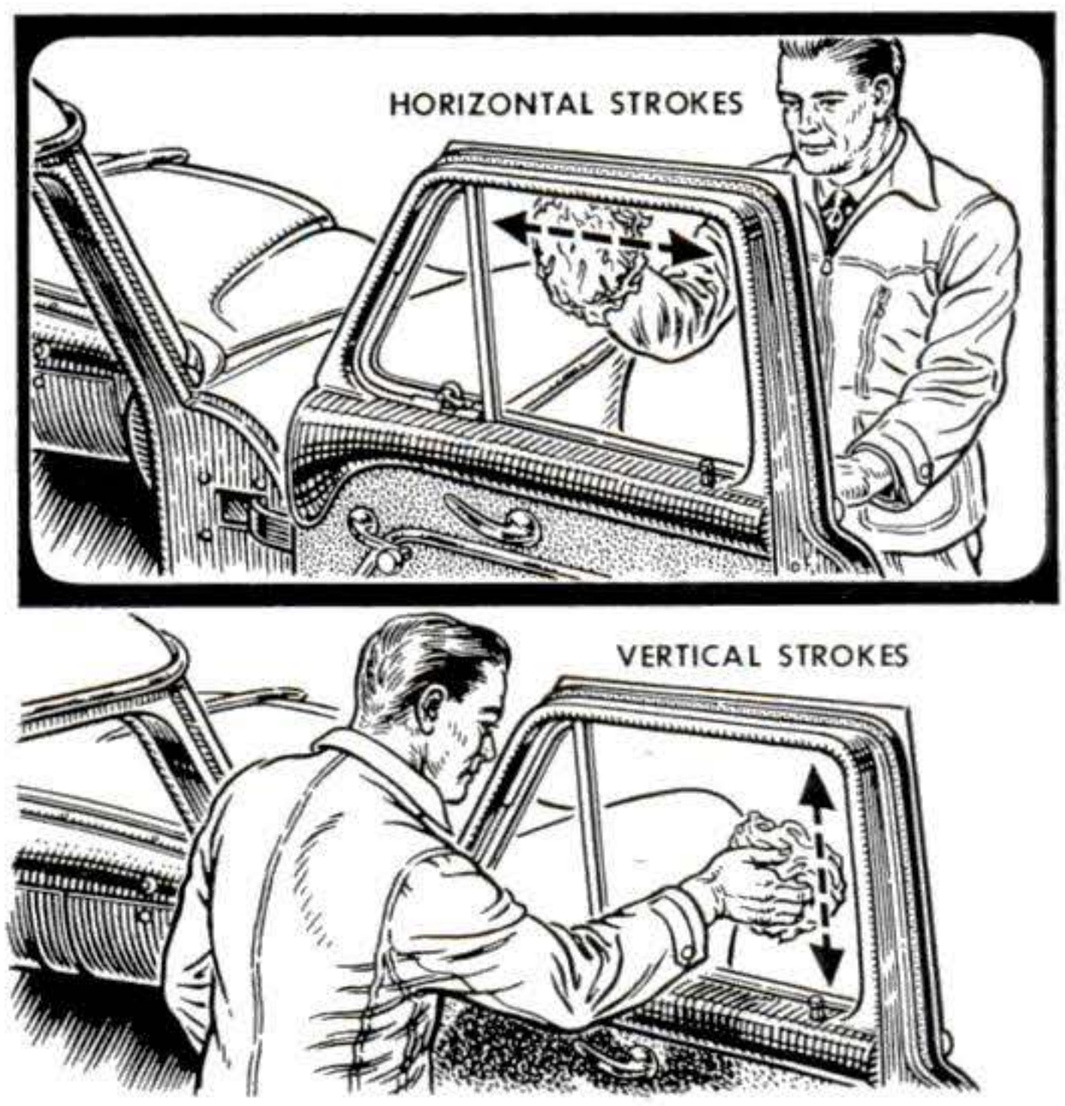
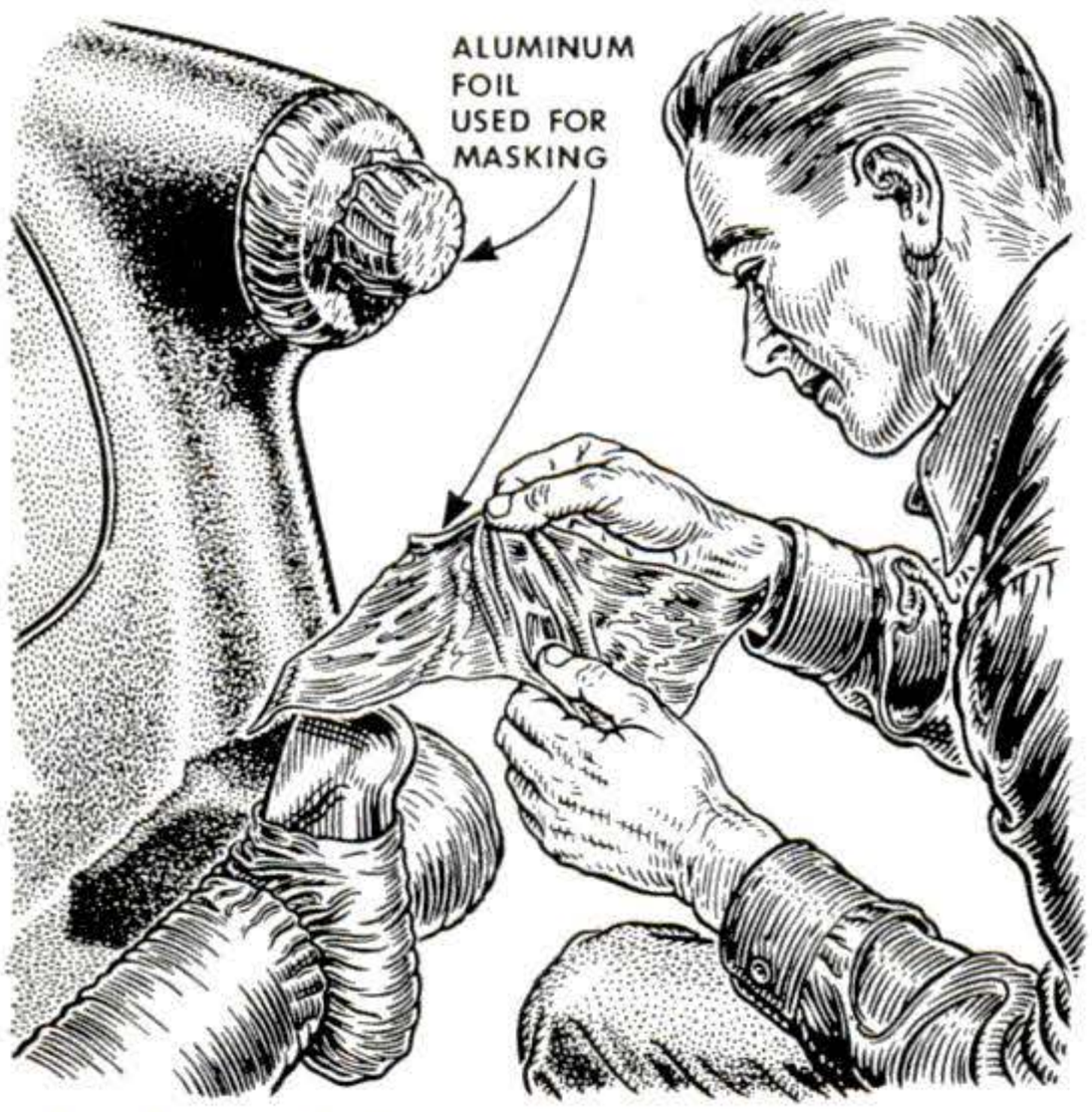
Hints FROM THE MODEL GARAGE



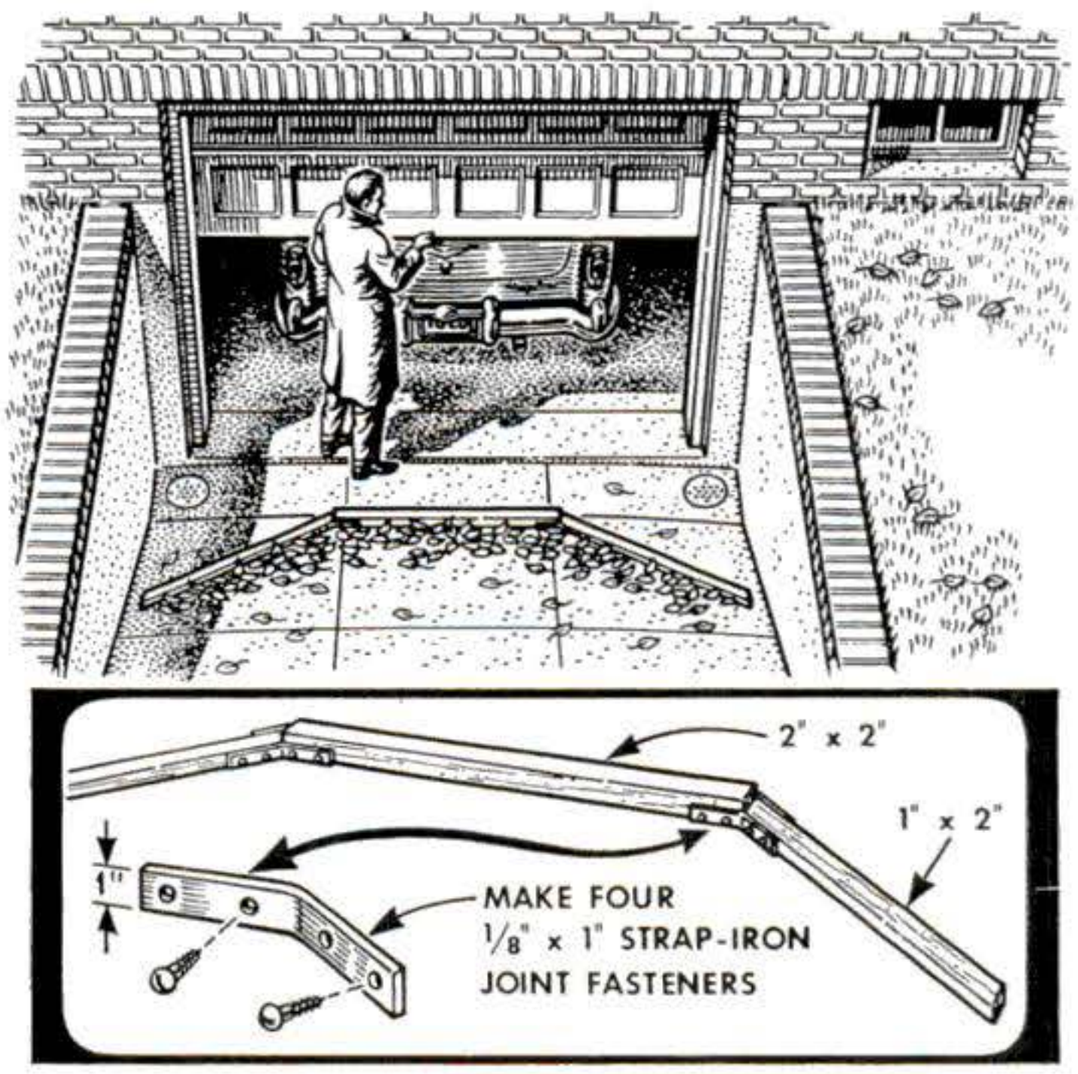
A touch oiler for a typewriter is a handy tool for doing a fast and thorough job of cleaning carbon from spark plugs. Even after a plug has been cleaned in a standard sander, the oiler may be useful for a final bit of scraping.



Stroke at different angles on opposite sides when cleaning your car windows and you'll then know at a glance which side needs more rubbing to remove streaks. No need to waste time trying one side, only to find the streak is on the other.



Aluminum foil can be used for masking bumper guards, bumpers, head lamps and other parts of a car when it is being spray-painted. The foil can be pressed around the parts without the use of tape. The sheets can be used repeatedly.



If leaves and dirt blow into a basement garage when the door is open, you can keep out most of the debris by installing a wooden barrier like this. The wheels of the car pass over the low end of the barrier without difficulty.

 Please turn to page 244 for more auto hints

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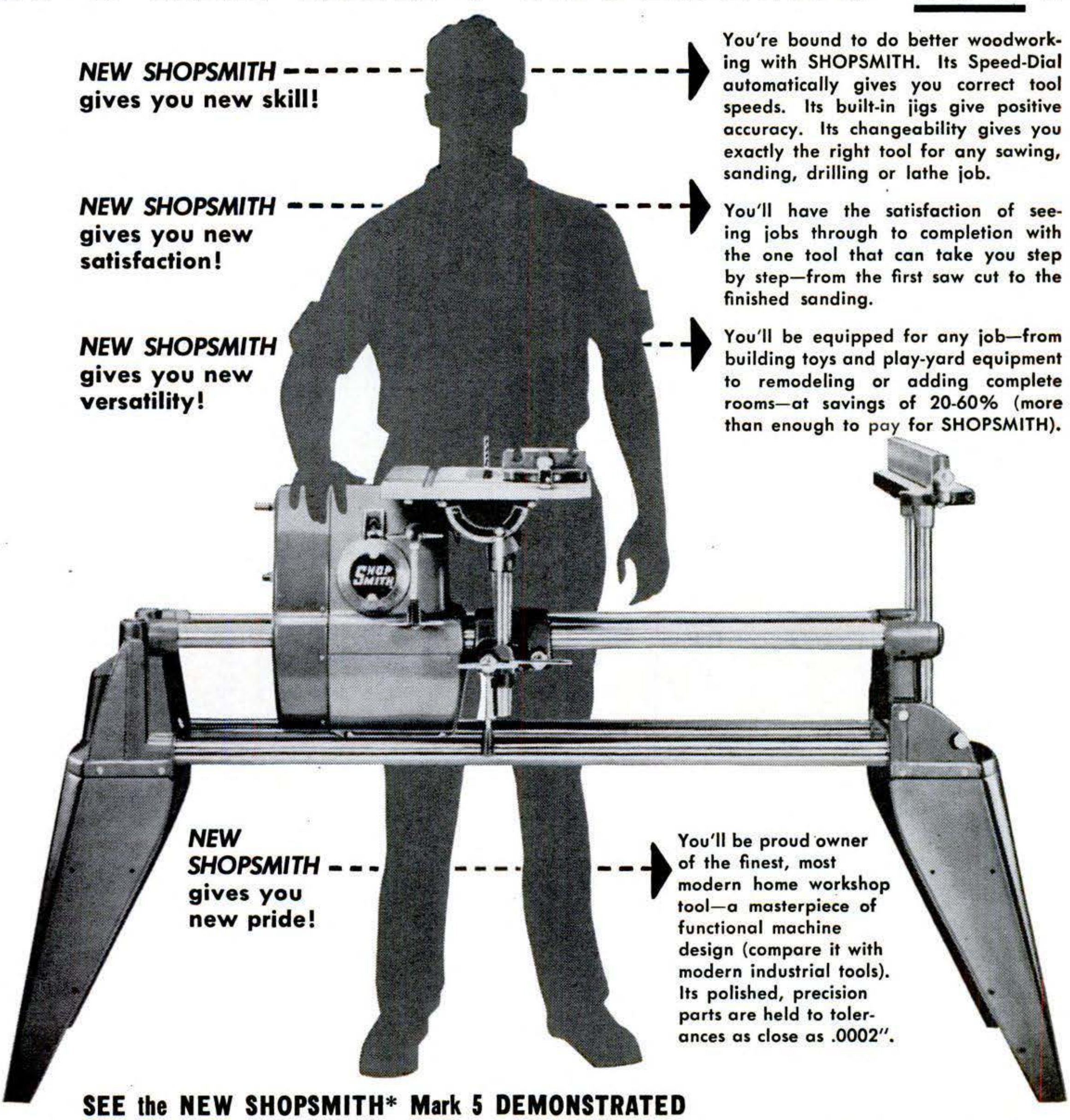
IT'S ALL NEW—INCLUDING YOU!



NEW SHOPSMITH **gives you new skill!**

You're bound to do better woodworking with SHOPSMITH. Its Speed-Dial automatically gives you correct tool speeds. Its built-in jigs give positive accuracy. Its changeability gives you exactly the right tool for any sawing, sanding, drilling or lathe job.

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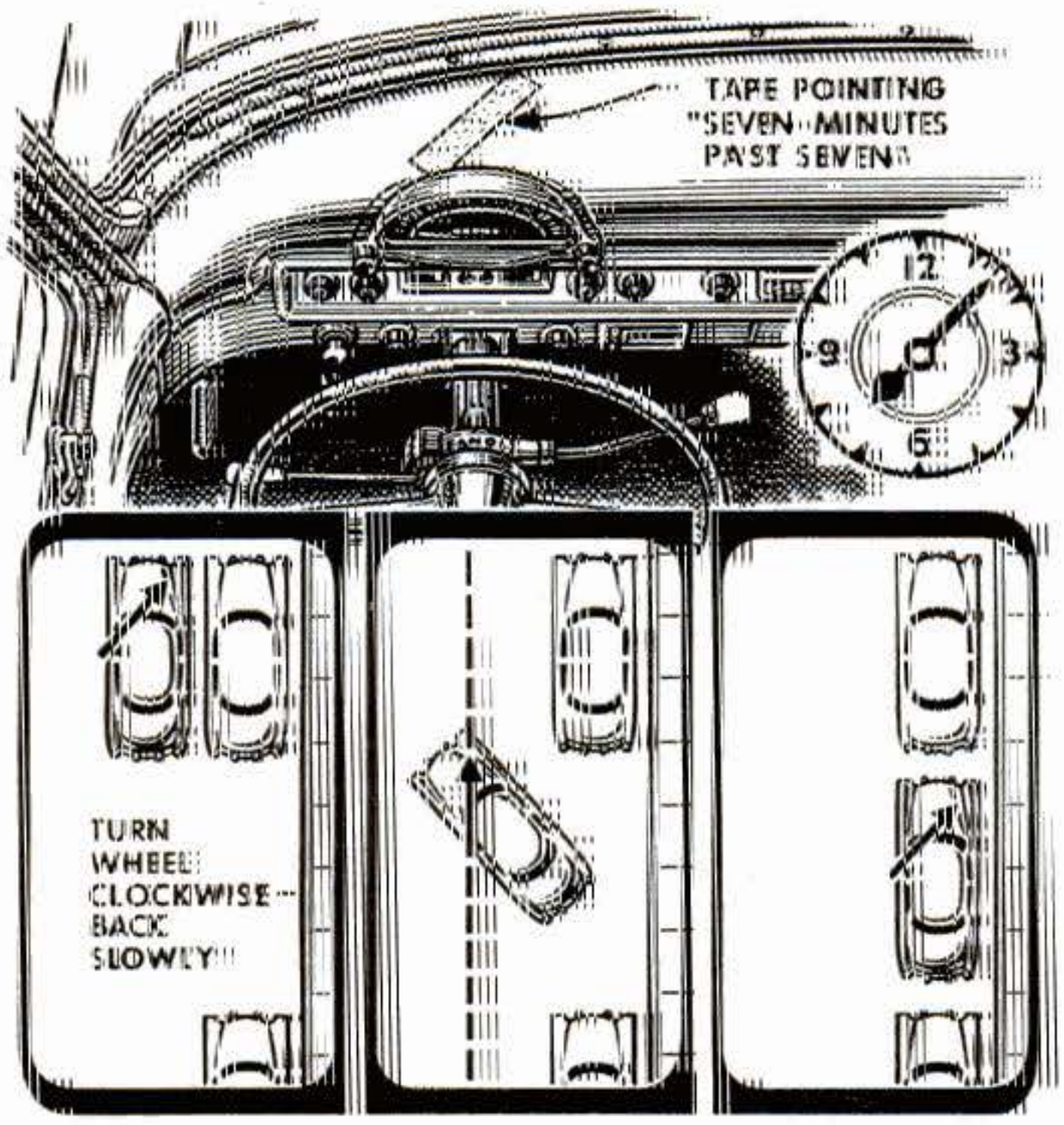
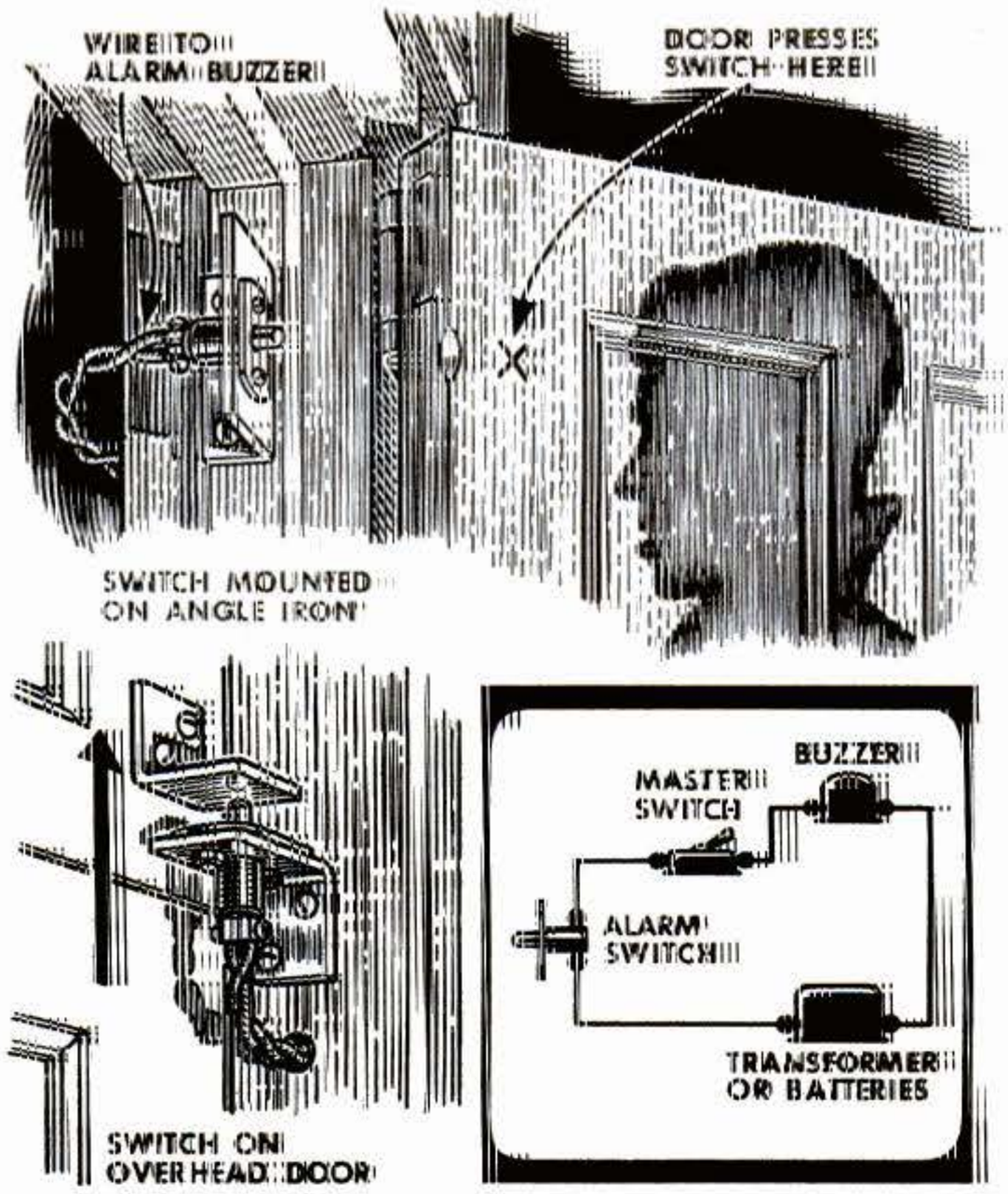
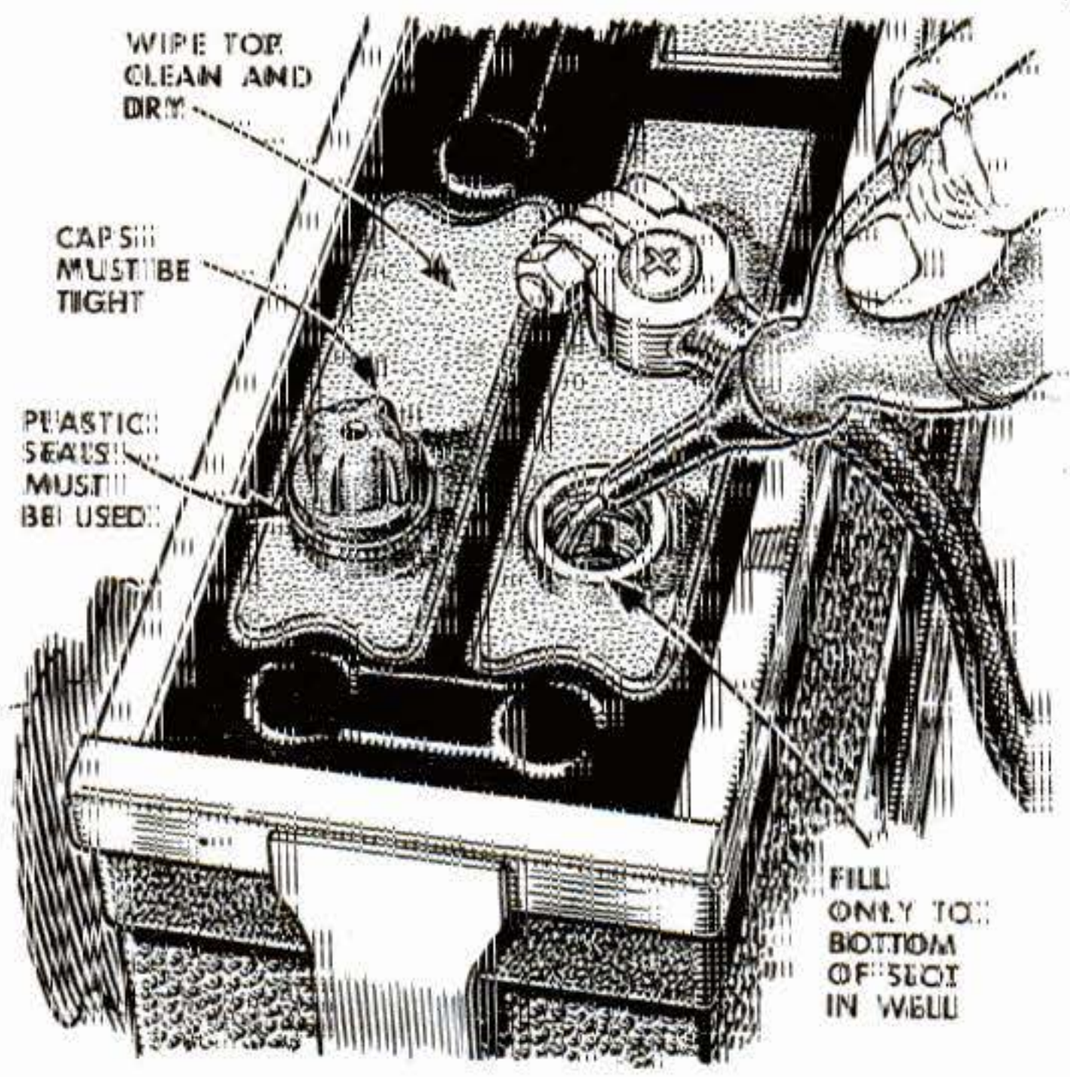
MORE Hints from the Model Garage



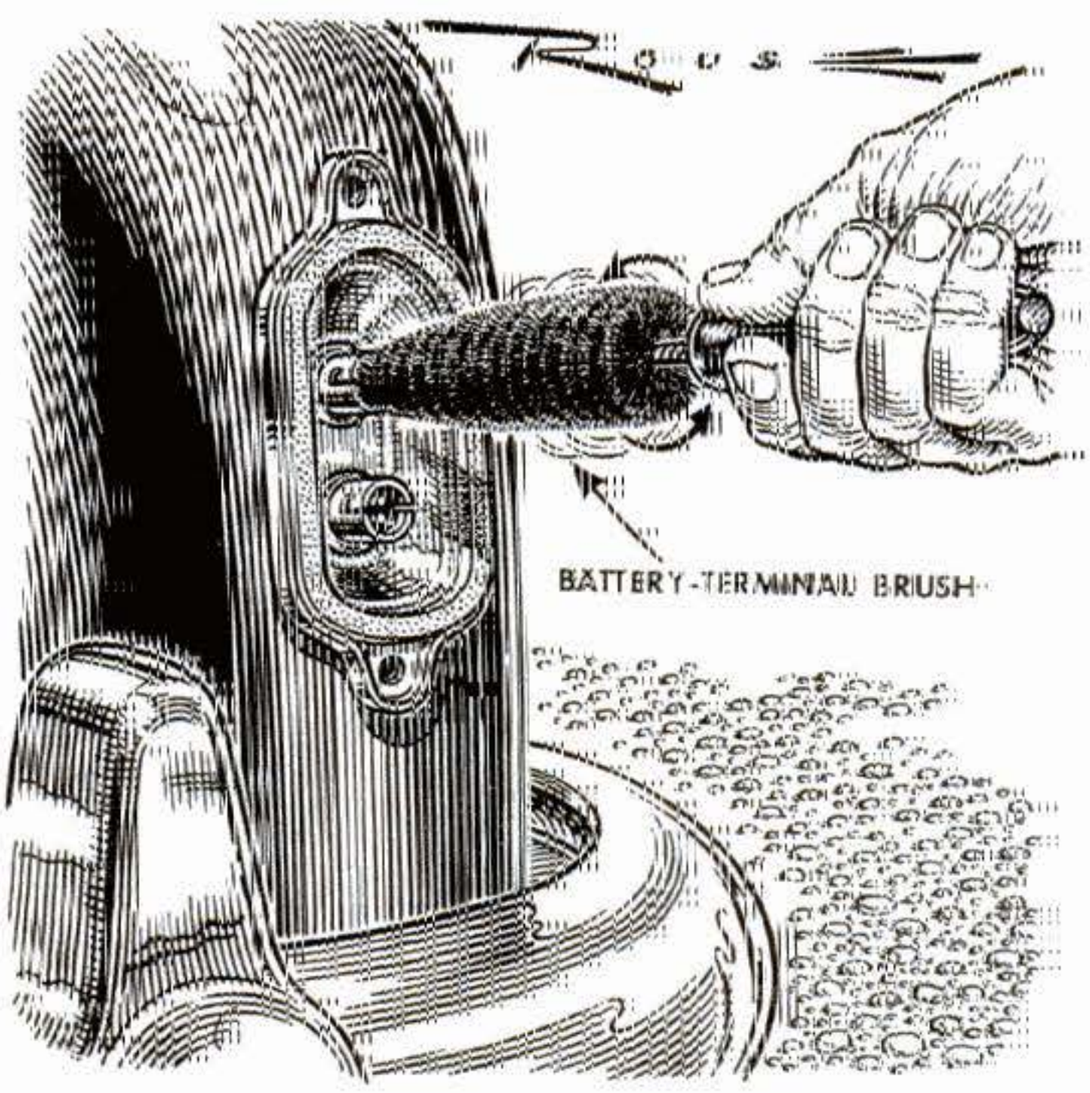
Parking in a tight spot is aided by an adhesive-tape marker on the dash shelf at a 7:07 o'clock angle. Stop parallel to the car ahead and about 18" away, turn wheel sharply clockwise, and back slowly until the marker points straight up the street. Cut all the way left, and back in.



A burglar alarm is easily rigged up on a garage door with an inexpensive car courtesy-light switch connecting a bell-wire circuit with a bell or buzzer in the house. A master switch wired into the circuit permits disconnecting the alarm when you open the door yourself.



If you own a 12-volt battery, extra care is needed to control factors that cause corrosion. After careful filling, wipe off any spilled water. Corrosion is speeded by high current flow across the top of a wet battery.



Dirty, corroded sockets in tail lights, small parking lights and older-type headlights can be cleaned with the end of a battery terminal brush rotated briskly inside the fixture. Turn off the switch to avoid a short.

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News About Glues

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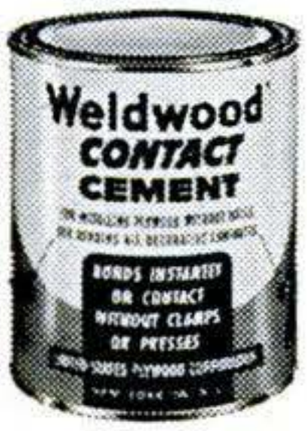

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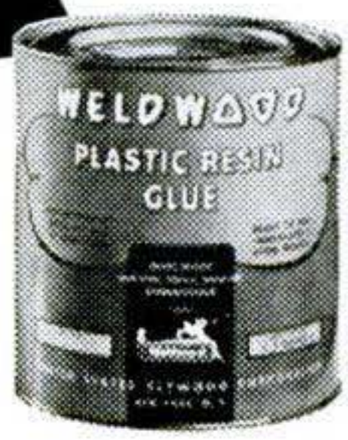

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[*Continued from page 168*]

he tossed his kit into the service car with a grim expression on his normally genial features.

"This settles it," he told Stan Hicks. "If that garage was locked, as Hibbard says it was, no one has been doing this. It's simply a mechanical problem. That I can handle."

This time Gus found Hibbard and Regan circling each other, perplexed, talking softly and warily.

"The garage," Regan reminded Hibbard, "was locked all night, until you opened it this morning to get out your car. Maybe you think I know how to pick locks, Bert?"

"Maybe," Hibbard said.

"It's those atomic-bomb explosions," Regan declared.

"Maybe," Gus cut in, "one of those flying saucers landed and one of those little green men from Mars did it."

No Flying Saucers for Model Garageman

Gus was all business now, his eyes alert beneath his heavy, graying brows. The distributor cap again was scattered about in bits. What was he to do now? Gus asked himself. One thing he wouldn't do was to blame the neighbors, atomic explosions or flying saucers. Perhaps that new rotor he had put in was too long—yet he knew it hadn't been.

Inspecting the broken pieces of distributor cap, Gus gathered the impression that they had been blown outward rather than smashed inward by an outside blow.

Internal combustion. . .

In a gasoline engine, this meant gas fumes, ignited by a spark, in a confined area. In the distributor there was a confined area, and as these explosions must have occurred just at the moment Hibbard tried to start his car, there would be a spark from the flash of the ignition points. The sound of the explosion might have been muffled by the grinding of the starter motor.

But how could gas get in the distributor? Could it get from the crankcase, up through the distributor shaft? It was possible but not probable, in enough concentration to fire. Where else could gas fumes come from? What other opening was there into the distributor from a source of gas or gas fumes? How about the automatic vacuum spark control? Gus eased his back muscles as he thought about this.

"Stuck, Gus?" Hibbard queried anxiously.

"Maybe," Gus said thoughtfully.

The vacuum control, a diaphragm connected by tubing to the intake manifold, retarded the distributor timing under heavy load, and advanced it when the load eased up. Thus the manifold was a possible source of gas fumes. What if the diaphragm were punctured?

If conditions were right and fumes collected in the distributor, a spark from the points would blow the cap apart. But if conditions were not just right, if the fumes did not collect in the right proportions, it wouldn't happen. Gus snapped his fingers. This would account for several days elapsing between explosions. He began to tear down the vacuum spark-advance control unit.

Sure enough, the diaphragm was defective.

Bending Clips Caused Explosion

"It didn't blow the cap apart the first time," Gus explained to Hibbard, "because the spring clips flew off easily. But after I bent them and attached them firmly the cap exploded under pressure."

Gus's installation of a new vacuum control unit ended the mystery of the exploding distributor caps, even to the satisfaction of those who were inclined to see fiery saucers, pink snow and little green men. And the next Saturday morning, driving by Hibbard's place, Gus saw Bert holding the ladder for Mike Regan while he sawed at a dead limb on the big maple that hung over their adjoining lawns. END

NEXT MONTH: Gus encounters a stubborn miss.

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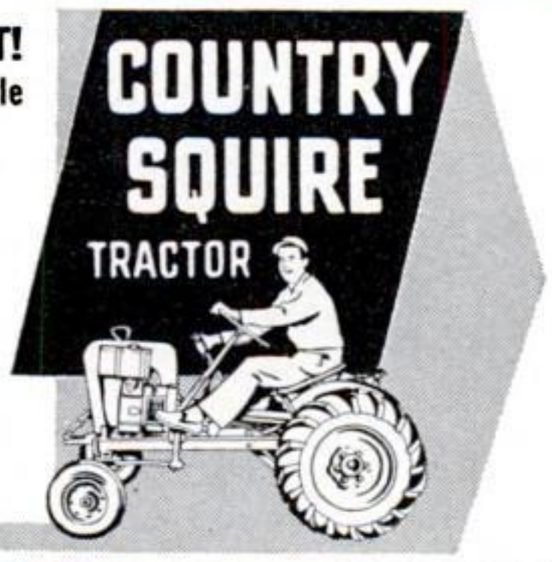

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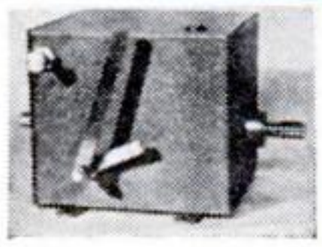

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Care and Feeding of Engines

BY
S. P CORP

FACTS ABOUT ANTI-FREEZE

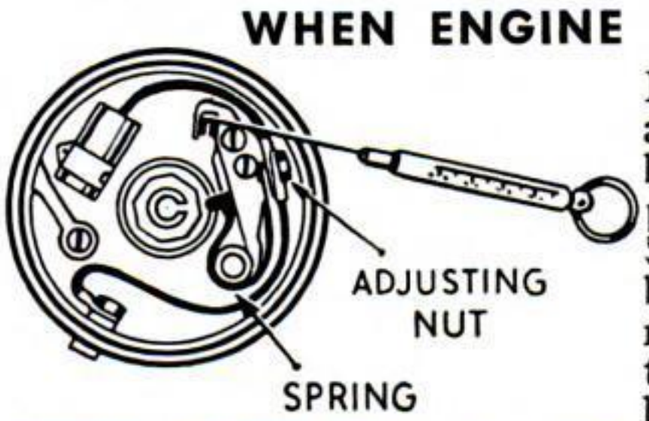
Before adding anti-freeze, your cooling system should be flushed with clear water and allowed to drain. After adding anti-freeze, run engine till solution is thoroughly mixed, leaving radiator cap off so air can escape. Then stop engine and check level of solution in radiator, being sure hydrometer is clean and bulb is free to move. Fill and empty hydrometer several times to get a correct reading, as all hydrometer tests are calibrated for the temperature of the solution.

ANTI-FREEZE SOLUTIONS PROTECTING TO -20°F

Never mix glycol-type anti-freeze with alcohol-type, as freezing points vary widely and accurate testing would be impossible. Do not mix different brands of alcohol-type anti-freeze, as rust-inhibitors may cause a chemical reaction that would reduce anti-rust effect. Do not use anti-freeze from one year to the next unless you add new rust-inhibitor. Rust-inhibitor will lose its effectiveness after one year.

Always tighten hose clamps or replace hose when adding anti-freeze. Anti-freeze will seep through places where water will not pass. Be careful with stop-leak compounds; don't use them to stop a hose-leak.

WHEN ENGINE CUTS OUT



If your engine cuts out at speeds over 50 mph, here are two of several possible causes: SPARK PLUGS may be of too hot a type, missing fire under extreme heat, and should be replaced. Or SPRING TENSION in distributor may need adjusting. This tension should be 17 to 20 ounces. Measure with an ounce scale as shown, then loosen adjusting screw and move spring in or out till correct tension is reached.

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Sealed Power has just published a brand new manual, "Care and Feeding of Engines," made up from these helpful columns which have appeared in leading magazines. Handy cross-index makes it easy to find the answer to almost any engine problem. A postal card to Sealed Power, Dept. H-1, Muskegon, Michigan, will bring your free copy promptly. When you re-ring, get the best—Sealed Power KromeX Ring Sets.

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PISTON RINGS

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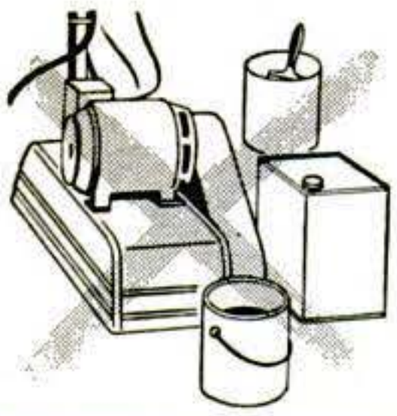

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[*Continued from page 196*]

Wash it in place, and don't worry if thinner trickles down the intake. It evaporates and won't do any harm.

The choke linkage, high-idle cam and throttle parts should be washed until they gleam and no residue can be seen. These parts must move with perfect freedom. They work best when clean and dry; no lubricant is needed.

To wash the inside of the thermostat housing, remove the cover. A black plastic case identifies the Carter breed; a coinlike plate with degree markings, the Stromberg. How you reset the cover against thermostat tension determines choking. Wind it too tight and your engine will run choked all the time. Wind too little and, as a result, you'll have no choke action.

Setting is simple. Adjusting this is no harder than setting an alarm clock. There is a mark on the housing and a mark on the cover. Set mark to mark and you'll probably get by. However, most cars have specific settings a notch or so rich or lean. You can get this dope from a shop manual or dealer. In Wisconsin, I usually go about two notches rich for the winter and about the same toward the lean side for summer driving. Arrows on the covers tell you which way to turn.

Since you have to yank off the air cleaner anyway, you may as well check and clean it if necessary. If you've been on dry, dusty roads, you may find a fair chunk of real estate in the cleaner. This indicates the need for washing out the cleaner mesh and putting a fresh supply of heavy oil in the pot. END

A Shocking Sentence

A man was arraigned for assault and brought before the judge.

Judge: "What is your name, occupation, and what are you charged with?"

Prisoner: "My name is Sparks; I am an electrician, and I am charged with battery."

Judge: "Officer, put this guy in a dry cell." —*Pure Oil News.*

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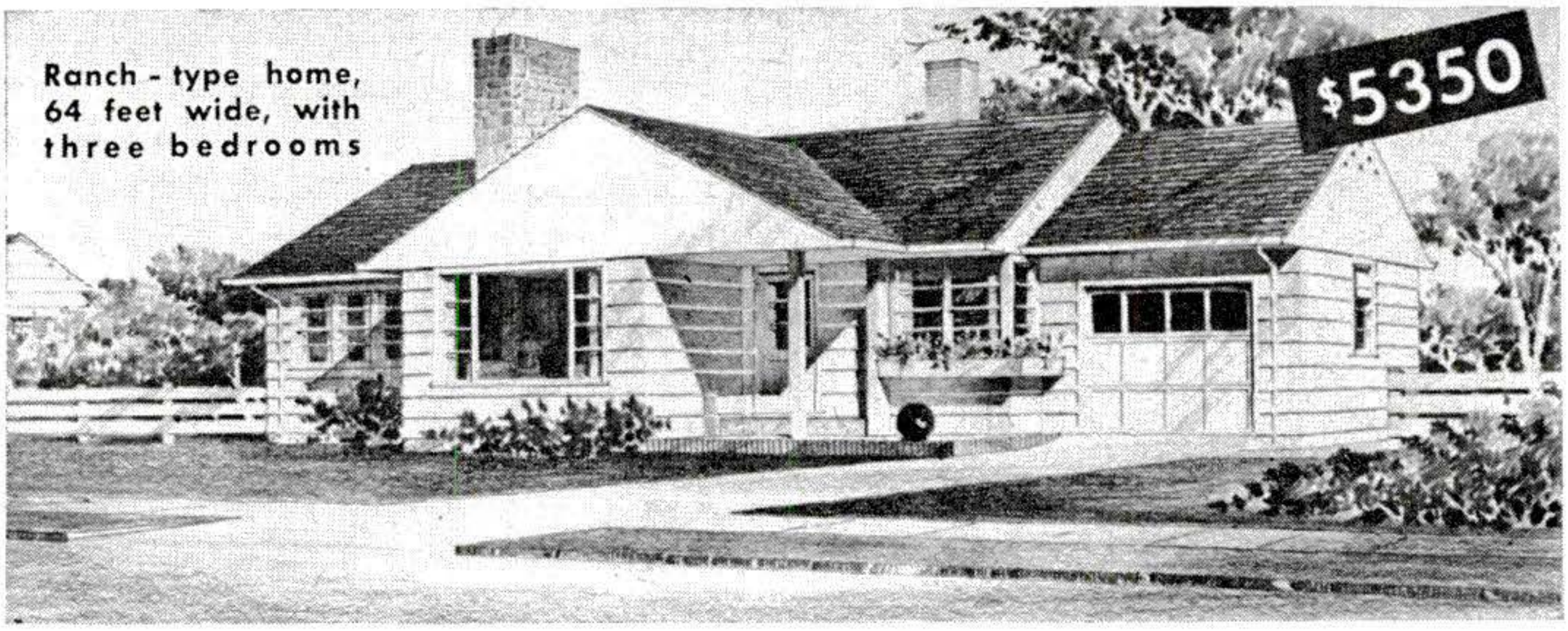

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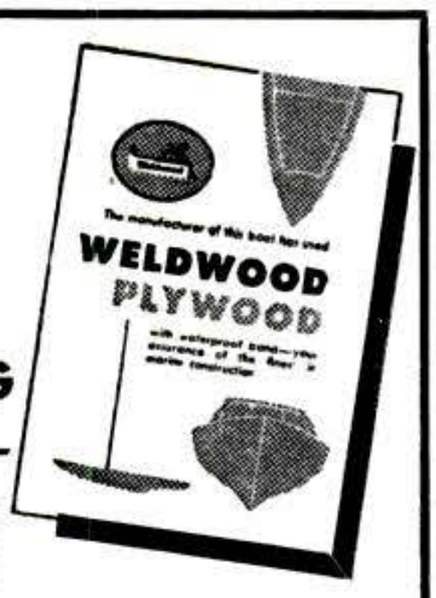

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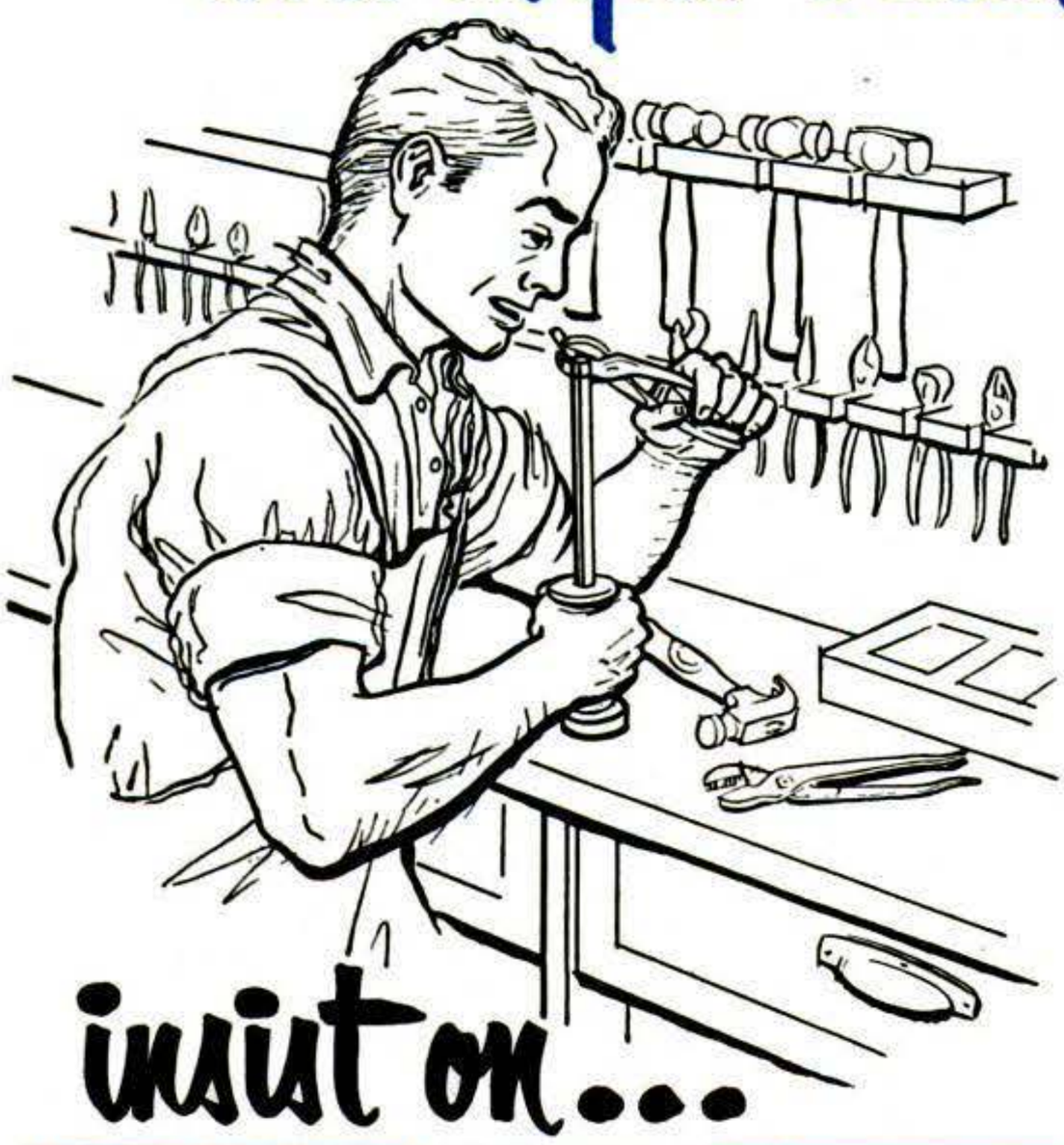

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What You Should Know About Abrasives

[Continued from page 217]

As a rule of thumb, use either the cloth or paper backings in a weight light enough to bend as much as necessary without cracking. When this happens, switch from paper to cloth or to the next heavier weight in either type.

Cloth and paper backings (except flint and emery) also come in waterproof versions that permit wet sanding. You can use water, oil, kerosene, mineral spirits or whatever other liquid you want.

Wetting the paper softens the abrasive action and helps prevent clogging, as the liquid tends to wash away the chips, and dissipates heat that might alter or discolor a finish. Use wet sanding mainly to smooth paint and other finishes and to work thermosetting plastics, glass and ceramics.

There are many forms. Everyone is familiar with ordinary sandpaper sheets, but you'd be surprised at how many other forms are available. Most abrasives can now be bought in continuous rolls, of various widths and backings. You'll want these for magazine hand-sanders, for sanding in lathes and other power tools, and for wrapping special-purpose mandrels.

Disks, an old stand-by, have branched out to include most of the abrasives, grits and backings made. You can buy them either with slotted centers for portable tools or in plain disks for stationary power sanders. The only caution here is to avoid the use of disks on large flat areas, particularly on fine painted or natural finishes, where the rotary motion tends to cut swirls in the work that will show up later. For these jobs, use a hand or power action that produces a straight back-and-forth motion in the same direction as the grain of the wood.

Drums and belts come in many types, sizes and grits that make it easy to do a wide variety of curved and contour jobs. Belts, in either a portable or stationary tool, also do a fine, fast job on flat work. Belts are usually backed with cloth, drums with heavy paper.

[Continued on page 252]

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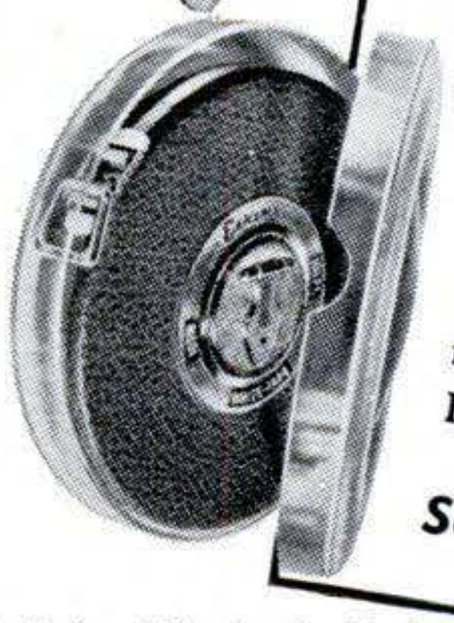

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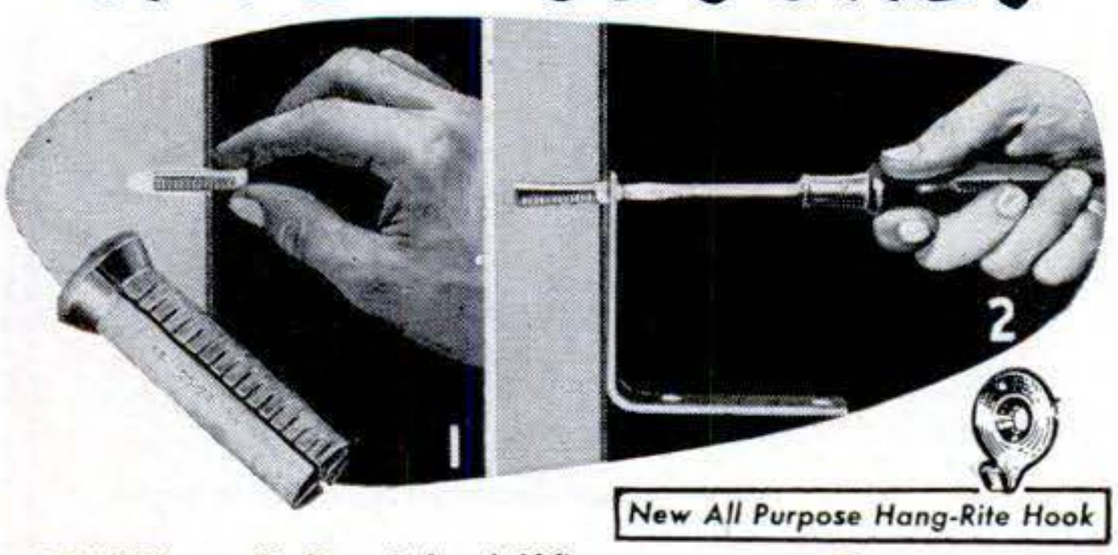

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U-S-E Multi-Diameter* Wood-Screw Anchors have unusual holding power. Anchor shifts sideways as it expands within the wall making a secure mounting that will not become loose. Sold in various sizes.

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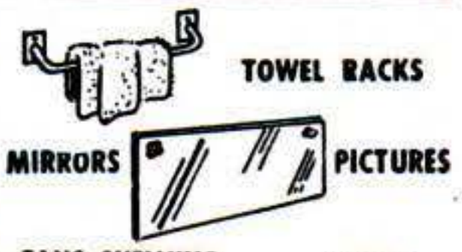
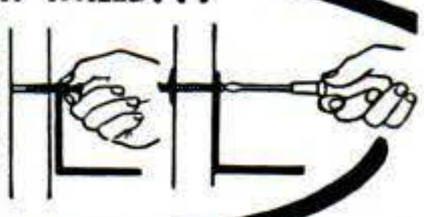


FANS-SHELVING or Any Household Appliance

At all Hardware & Building Supply Stores

FOR HOLLOW WALLS...
U-S-E Golden "Loktite" Hollow Wall Fasteners hold Fixtures securely in lath and plaster, wallboard, tile, cinder block, etc. Easy to install. Will not pull through.



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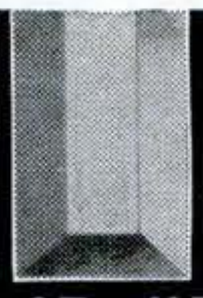
U. S. EXPANSION BOLT COMPANY DEPT. PS 1 YORK, PA.

Only the good best is enough

and Shark Chisels Brand ARE TOPS!

Shark Brand Chisels are made of genuine Swedish Charcoal steel hardened, tempered and honed to a razor sharp edge the way only Swedish tool makers can do it!

"Shark Brand" Chisels actually hold their edge longer — much longer than ordinary brands and are designed to make professionals approve and amateurs amazed. See them at your hardware dealer, but be sure to look for the "Shark Brand" trade mark—it's your assurance of perfection—or, if you prefer, write us for new chisel folder and prices. Dept. PS-1



Sandvik *Saw & Tool*

47 WARREN ST., NEW YORK 7

DIVISION OF SANDVIK STEEL INC.

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[Continued from page 250]

You can also get glued rolls and cone-shaped abrasives, used mainly for deburring and other machining operations. These have less use in a home shop, though, and if you buy them you'll also need special mandrels for your power tools to take them.

Where to buy them? Small hardware stores in many towns may not stock a wide range of abrasive papers, but can often order them for you. If not, there are many other sources you can try.

Paint stores usually carry flint paper (mainly for removing paint) and garnet paper in the grits most likely to be used in finishing wood and painted surfaces. They may be able to supply finer grits than even a hardware store may have on hand. Hobby shops catering to ceramic and lapidary work may carry many of the special-purpose papers. Auto-supply houses are a good source for papers used in working paint finishes, metal and glass.

The small mixed packs of paper, available in almost any 5-and-10 or variety store, may sound like an awfully unprofessional way to buy sandpaper, but actually these packs aren't half bad. They're a good get-acquainted start and offer a wide enough variety to tide you over a late-evening or Sunday project when the stores are closed.

Shops that rent power tools stock many papers for their own use and will sell them to you if your own tools happen to be the same. If all else fails, wholesale hardware dealers and mill-supply houses will usually sell you what you want when you can't get it at retail. Your local hardware store, machine shop or lumberyard can give you the names of such houses.

So now you won't go into a hardware store and just say: "Gimme some sandpaper." You'll say: "I want six sheets of garnet paper, 120 grit, 'A' weight, closed coat." And the hardware salesman will be glad to meet a real craftsman who knows his coated abrasives. END

IT SMELLS GRAND

WANT AROMA WITH "LIFT"? MAN, HERE'S HOW

IT PACKS RIGHT

AND IT PACKS SO NEAT IT RATES A BOW

IT SMOKES SWEET

IT'S THE PIPE-BLEND CHAMP YOU MUST ALLOW

IT CAN'T BITE!

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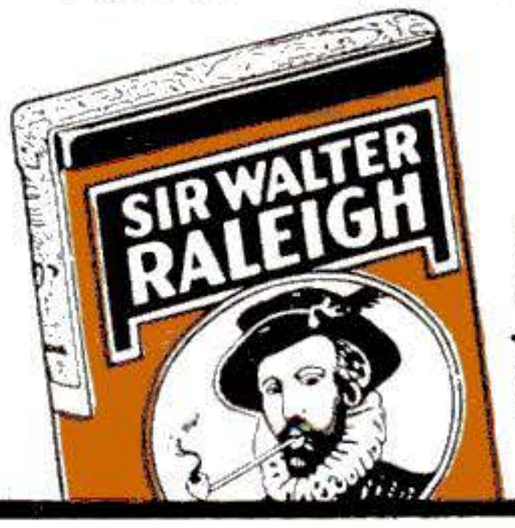

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24-PAGE BOOKLET ON PIPE CARE. JUST WRITE TO: SIR WALTER RALEIGH DEPT. F5, LOUISVILLE, KY.

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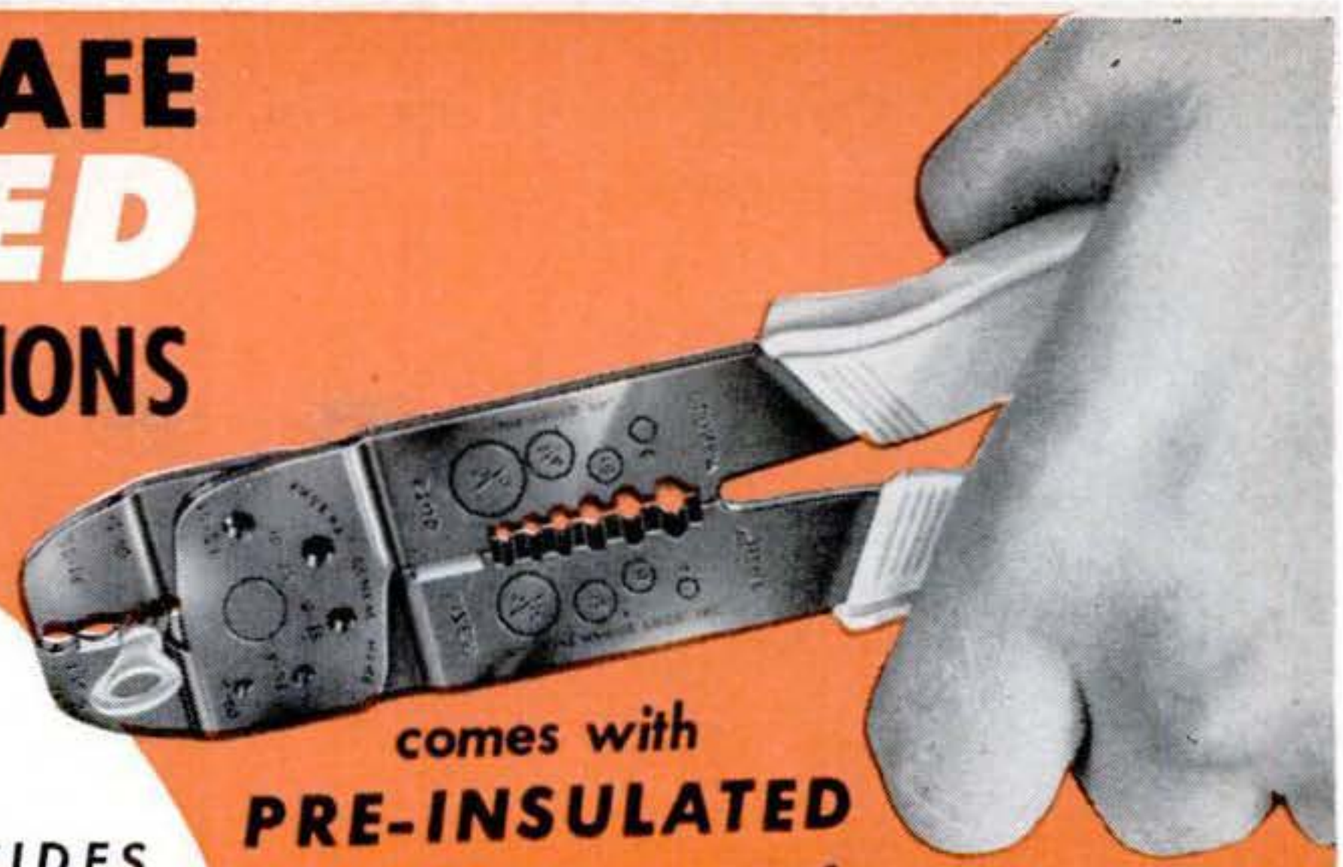

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The ONE Tool for ALL Wire Sizes used in Home Wiring, Appliances, Automobiles.

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CRIMPS Solderless Terminals and Connectors without solder or tape for safe connections.

CUTS Wire, making clean, sharp cut through Insulation and Conductor.

STRIPS Wire sizes #22-#10. **Gauges assure proper length for sure, safe crimp.**

SHEARS Bolts and screws **without damaging threads — no filing or hack sawing.**

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Speedy Sprayer

ONLY $36.50 Less motor

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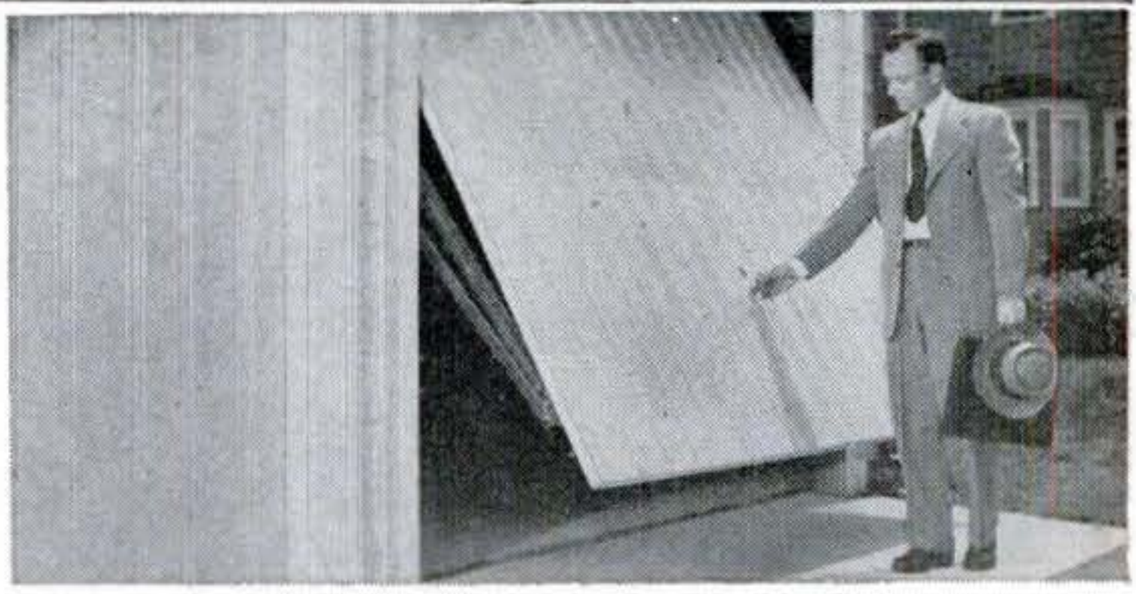

HOW TO GET A NEW GARAGE DOOR AT LESS THAN HALF PRICE!

Yes, you can have a swing-up garage door like the one shown here — complete with Stanley Swing-Up Hardware for *less than half* what you'd normally pay!

How? *Build it yourself* from Easi-Bild's* Pattern No. 86. It's easy! No special tools — no special skill! Just follow the clear, "can't-go-wrong" directions of the pattern. Tells you everything — including what materials to buy, where and when to use them. Stanley Garage Door Set is simplicity itself to install. You'll be amazed how quickly you can do the job — and mighty proud of your results.

Ask your dealer for Simplified Directions for Installing Stanley Garage Hardware and Easi-Bild Pattern. Or use coupon below. **Trade Mark Reg. U.S. Pat. Off. — Easi-Bild Pattern Co.*

EASI-BILD PATTERN CO., Dept. S-5, Pleasantville, N.Y.
Enclosed is 50¢ in coin, money order, check for Garage Door Pattern No. 86

Please send Simplified Directions for installing
( ) Single ( ) Double Garage Door Hardware.

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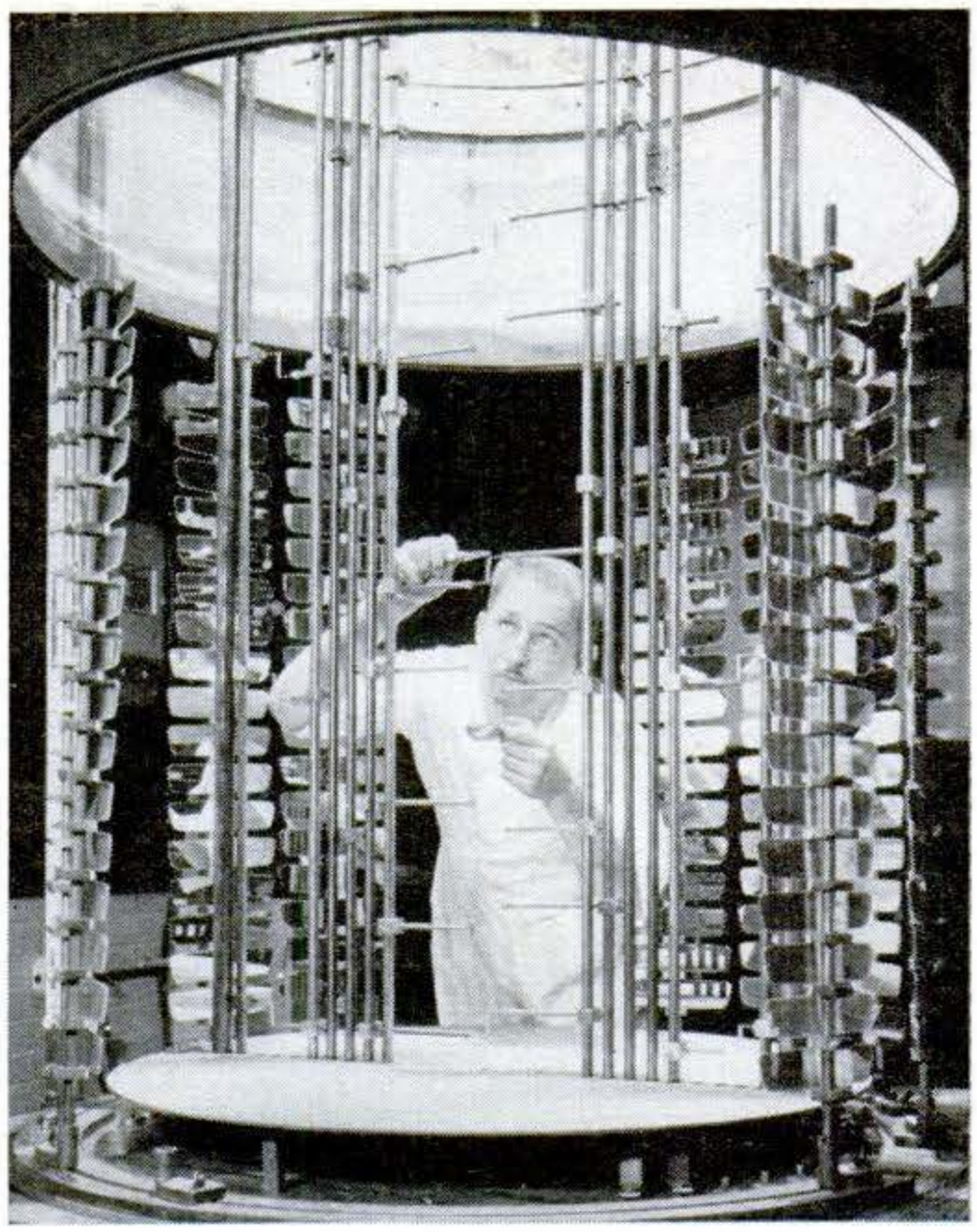
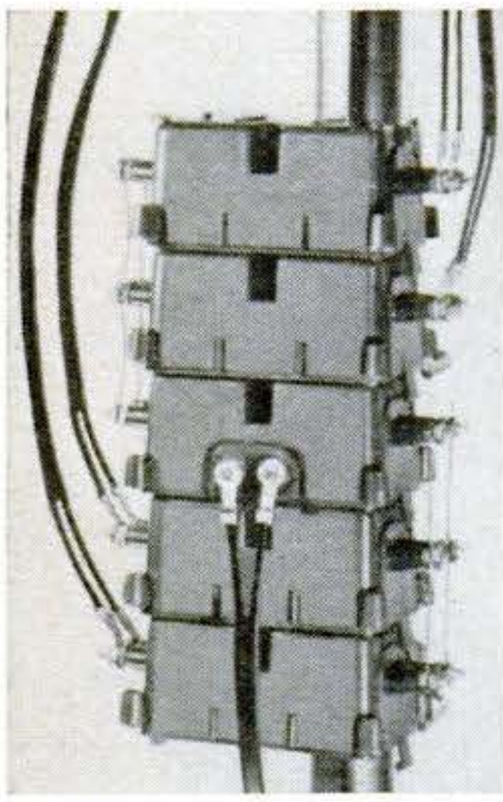
Mirror with "Gearshift" Lets You Select Bright or Dim Reflection

STACKS of rear-view mirrors are ready to get glare-killing coats in this big vacuum chamber (right). The mirrors have a "gearshift" knob that lets you select a bright, dim or very dim image. The knob varies the light intensity by changing the way in which it is reflected and filtered. Libbey-Owens-Ford developed the new mirror.



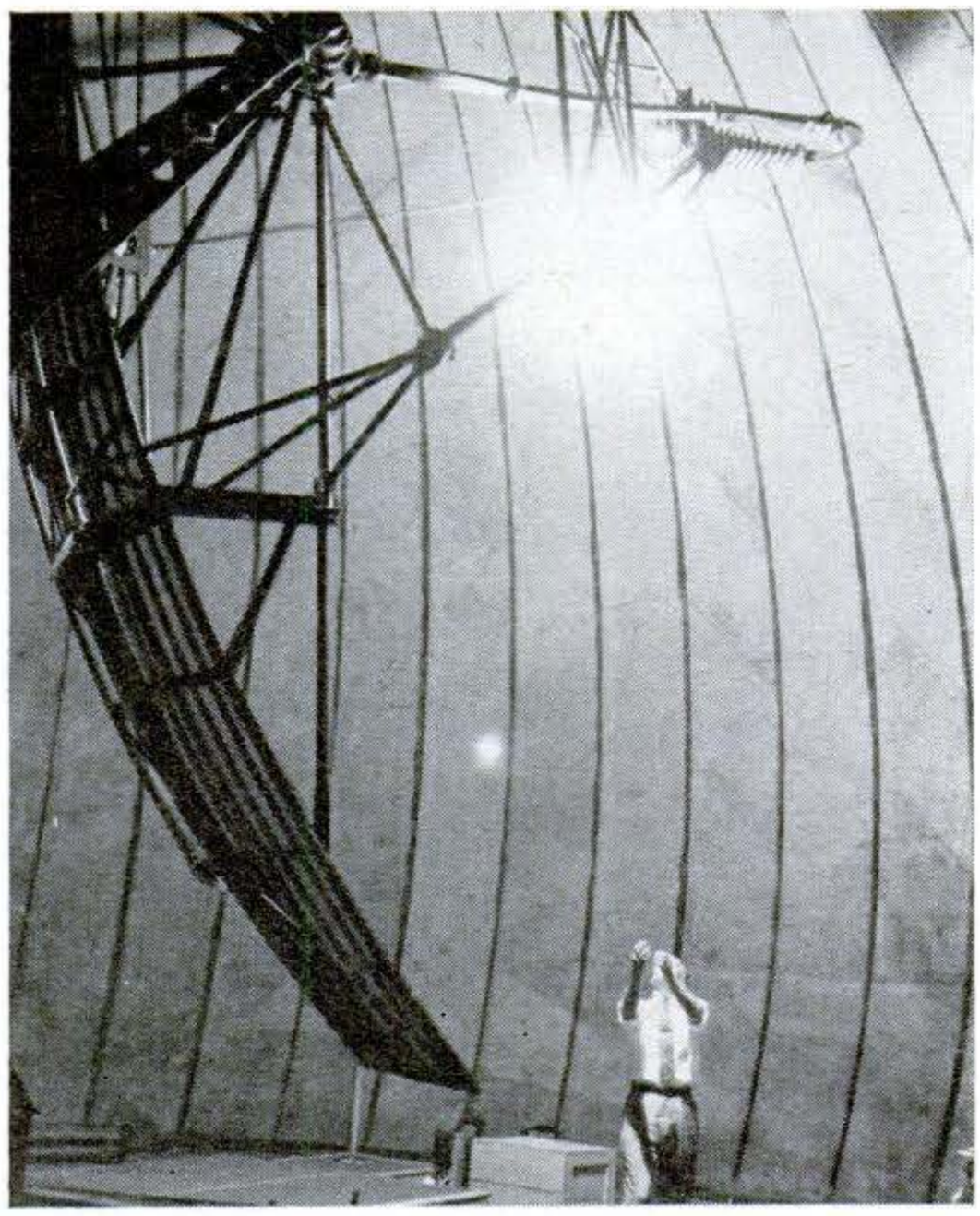
TV Aerial Aims Itself



THE boxes at left let you aim your TV antenna at scattered stations without rotating the antenna. You mount separate antenna elements (as many as seven) for each station direction. The SelecTenna filters automatically pick out the right element and feed the signal from that element into the lead-in wire when you switch the tuning knob on your set. Channel Master Corp., Ellenville, N.Y., makes it.

Fender Stove Warms Arctic Car

AT THULE Air Base in Greenland—where the temperature drops to 60 below in winter—the men mount gasoline-burning heaters on the outside of cars, jeeps and buses. A duct poked through a hole cut in the front fender feeds preheated air to the regular heater and boosts its output.



New Radar Is Farsighted

A FLASHBULB set off in mid-air provided light for this photo. Tossed in front of the antenna of a new powerful radar height finder, it was ignited by the radar beam. General Electric says the radar concentrates its energy in a narrow beam—like a searchlight—to detect high-flying aircraft.

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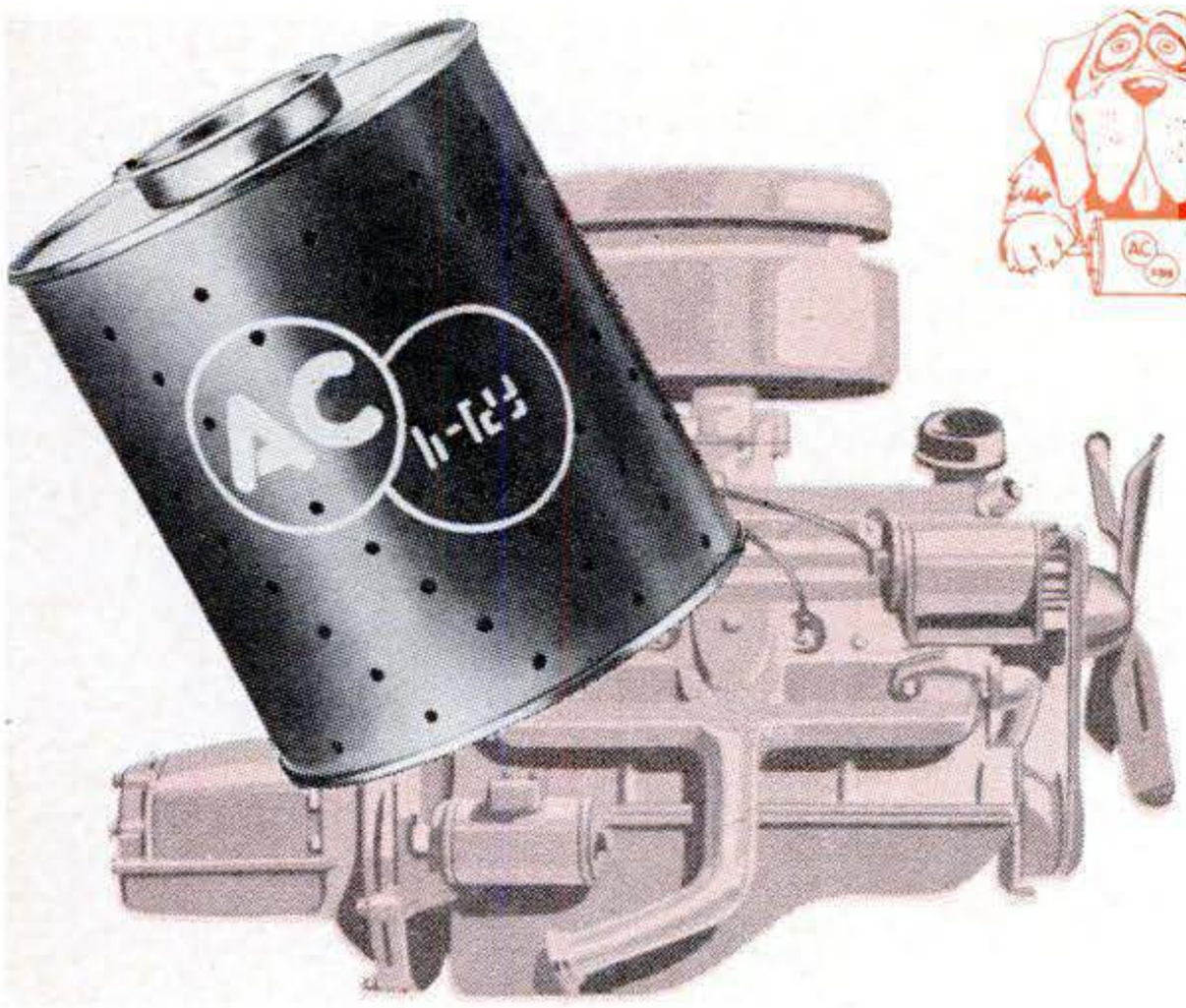
AC OIL FILTERS

—rescue engines from themselves!



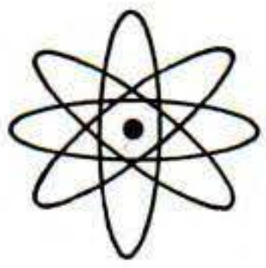
Long ago engineers realized that internal combustion engines produce something besides power. That something is a destructive combination of dust, dirt, grit, metal particles, carbon and acids that are picked up by the lubricating oil and recirculated. An oil change alone is not the solution. The oil itself needs the kind of protection AC Oil Filters give—filtering out the damaging grit—rescuing engines from themselves!

AC CUSTOM-ENGINEERED OIL FILTERS

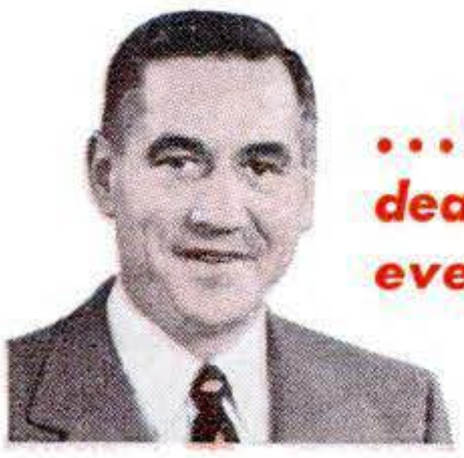
***Special* Material • *Special* Method • *Special* Form**

For years AC engineers worked to secure *better* filtering than density-type cotton fibre packing could provide. They found it in *paper!* Not any ordinary paper, but a *special* material fabricated to such exacting porosity standards that it freely passes oil while stopping foreign matter as tiny as 1/100,000th of an inch. Then AC developed a special curing process making the filtering material impervious to water and crankcase acids. AC accordion-folds this material so that it gives ten times the filtering area.

Atomic Research Techniques Insure AC Maintaining Oil Filter Supremacy!



Radiochemical techniques are being employed today as a part of AC's continuous product improvement program. Radioisotopes have been called into laboratory use in perfecting the filtering element, and the laboratory work, with customary AC engineering thoroughness, is backed up by proving ground and road test procedures. You can be sure AC Oil Filters will remain at the head of the class.



. . . have your AC dealer change your filter every 5000 miles.

AC SPARK PLUG DIVISION GENERAL MOTORS CORPORATION

Watch BIG TOWN on NBC-TV

AC ENGINEERING WITH GM RESOURCES CAN ALWAYS BE LOOKED TO FOR LEADERSHIP

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IN INDUSTRY...

The Jacobs Ball Bearing Super Chuck . . . unmatched for gripping power, accuracy and durability. *The* chuck for heavy duty drilling.

AND IN THE HOME SHOP

The Jacobs Multicraft Geared Key Chuck . . . the tight-fisted grip of fine light weight power tools. Multicraft is a simplified version of Jacobs' rugged Super Chuck.

This is another practical example of how Jacobs engineering skill converts industrial experience into practical benefits for the home shop tool user.

When you buy power tools for your shop, look for Jacobs on the chuck. Whether you prefer the Multicraft Geared Key Chuck shown here, or the Rubber-Flex Hex-Key model, there is none better than Jacobs. The Jacobs Manufacturing Company, West Hartford 10, Conn.

Jacobs
RUBBER-FLEX COLLETS

Jacobs
CHUCKS
If it's a Jacobs it holds

Amazing Machines Simplify Flying

[*Continued from page 105*]

crews. And human reactions and reflexes can operate just so fast.

Second, if air transportation is to improve, stricter schedules must be met, all-weather flying and landing techniques must be developed, and airport traffic must be handled faster.

Push Buttons Won't Oust Pilots

Talking about the AMSS electrical brain recently, Hugo Schuk, Minneapolis-Honeywell's aeronautical-research director, emphasized the idea that the trend to automatic flight is in no way aimed at eliminating the human pilot.

"Instead," he pointed out, "the aim is the elimination of the routine from flight operation, thus freeing the human pilot so he can be the true captain of his ship. The one thing that robots still can't do is think. So in the actual operation of the Sequence Selector, the plane will be flown automatically, but the pilot will be in charge to exercise judgment and take over when necessary.

"With the complexity of aircraft increasing at a terrific rate, and with congestion already a serious problem at most big airports, we are fast approaching a brand-new concept in flight operations.

"Under this concept, a plane won't take off until it has clearance all the way through from take-off to landing. In other words, it won't take off until there is a landing slot scheduled for it at its destination. Such operations will demand the utmost in precise scheduling and navigation. If planes have to come in for landings on flight schedules that are timed right to the second, we won't be able to depend on human pilots. It will have to be done with robots." END

State of Mind

A girl applied for a job as a steno and was given a test in spelling. "How do you spell Mississippi?" she was asked.

She thought hard for a moment and then said, "The river or the state?"—*Bruce Magazine.*

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Makes 1001 Money-Saving Projects!

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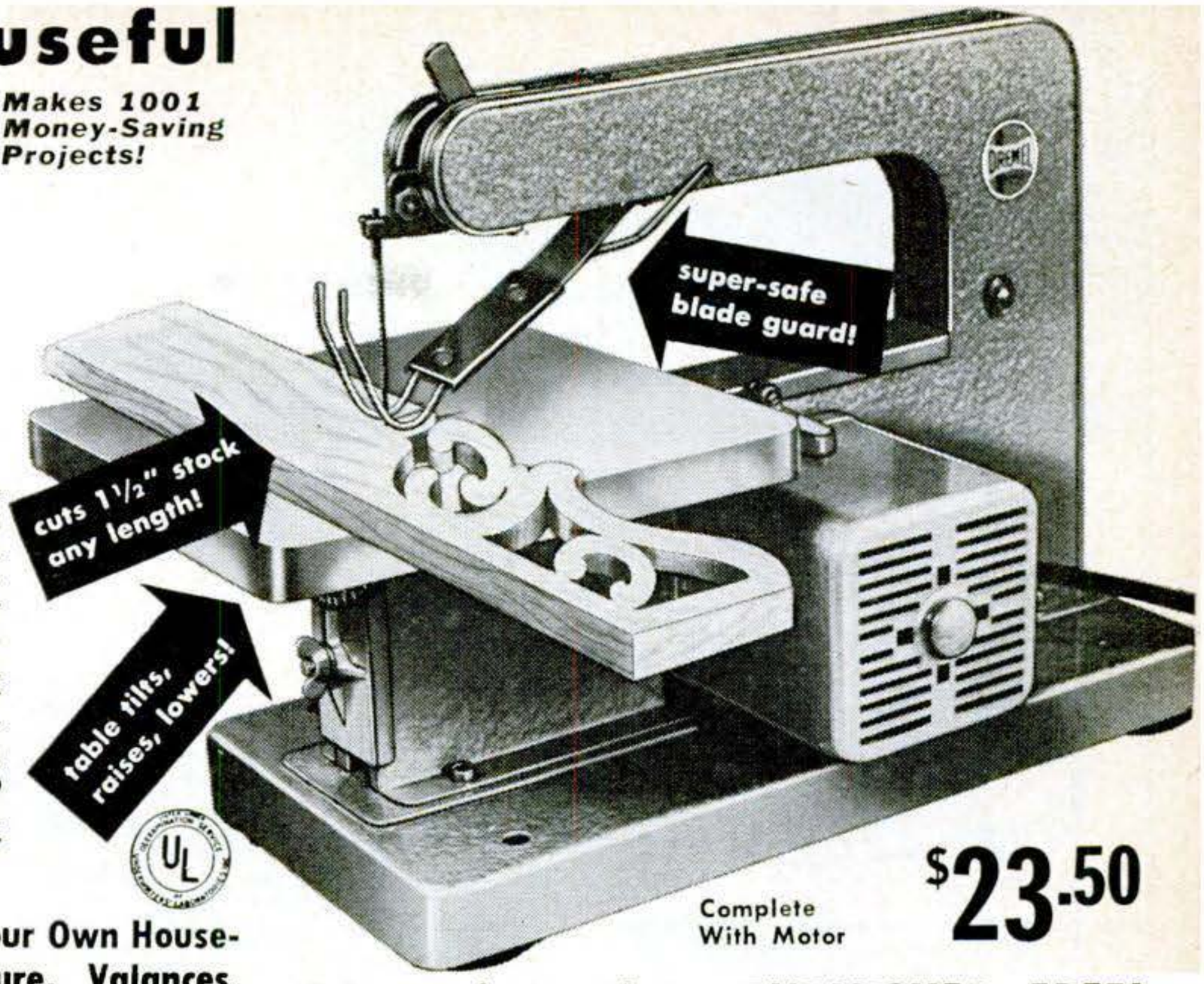
Work with wood, plastics, metals!

NEW DREMEL MOTO-JIG SAW WITH BUILT-IN ROTARY MOTOR!

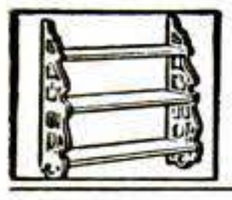
Thousands of families have already discovered this new DREMEL way to productive, exciting hobby fun. You owe it to yourself to see and try this amazing new jig saw that is taking the country by storm. What a performer—nothing like it on the market today! The DREMEL is the only jig saw in its price class with a real rotary motor. Why, it even cuts 2x4's! Saws intricate scrolls . . . delivers 3,450 strokes per minute! Compare it—you'll agree it out-performs others costing many dollars more.



Complete With Motor **$23.50**

Make 1001 Valuable Projects! Do Your Own Household Repairs! Build Lawn Furniture, Valances, Cabinets, etc. Make Toys, Decorations!

Work in plastics, metals, as well as wood. Start enjoying a family jig-saw hobby. It's wonderful training for the kids . . . saves you plenty on the things you make!



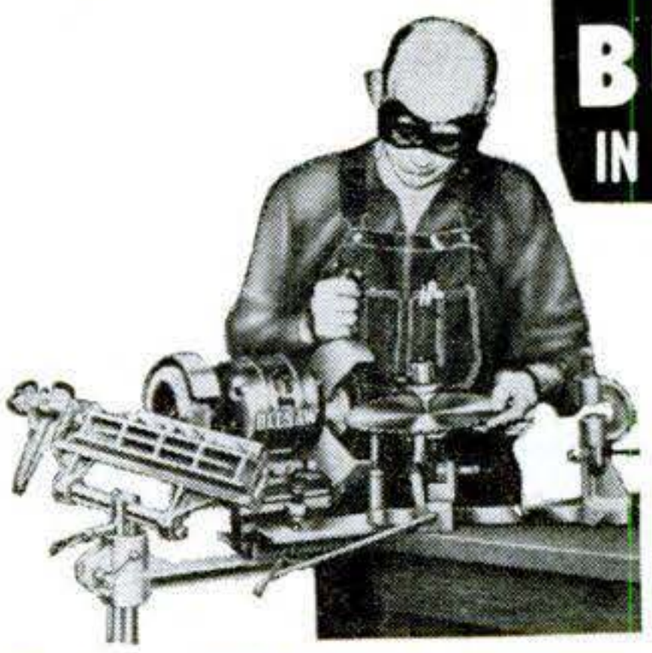
10 project plans FURNISHED FREE!

We'll get you started! With every purchase of a DREMEL Moto-Jig Saw, we'll give you the complete plans for making 10 practical projects. You'd pay several dollars for similar plans elsewhere.

SEE YOUR DEALER. If he cannot supply, order direct on 5-day trial, money-back guarantee. Remit in full for postpaid shipment; or send $2 now, pay postman balance plus COD fee.

DREMEL MFG. CO., Dept. 125-A Racine, Wis.

YOU CAN START A $40 A DAY BUSINESS IN YOUR SPARE TIME



Andy Phillips says: "My BELSAW Sharp Smith gives me big profits at low expense — I can run 35 to 40 circular saws in an 8-hour day — that makes me $40 cash."

"I also get BIG EXTRA PROFITS . . . up to $4 an hour . . by grinding planer and jointer knives — there's always a demand for this kind of work."

You can start this REPEAT CASH business in your own home or garage while you are working at your regular job. Easy to operate, no experience needed. "Pays for itself from just 65 jobs." — *Harvey Jensen*

For as little as $15 down payment, you can get your BELSAW SHARP SMITH rushed to you.

FREE book tells how

YOU can start making money the very day your BELSAW SHARP SMITH arrives. Earns $4 to $5 an hour in your SPARE TIME sharpening and setting circular saws for builders, lumber yards, factories...Plus BIG EXTRA CASH, precision grinding planer and jointer knives, plane irons, wood chisels and drill bits. Hundreds of jobs in your own neighborhood. No extra equipment needed, no canvassing. Send today for your Free copy of "Life-Time Security."

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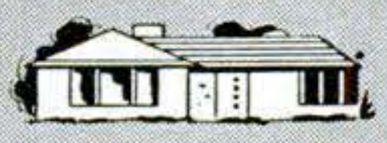
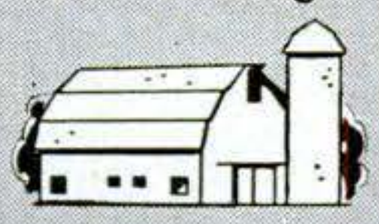


Garages

Farm Buildings



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Blocks Condensation, Prevents Heat Loss!

Building or remodeling a house, garage or farm structure? Here's a way to be sure of *warm, dry* floors all year 'round! One inch of Zonolite concrete insulates as well as 12 to 16 inches of ordinary concrete! **LIGHTWEIGHT...easy to mix. You can do it yourself!** A good investment in any building for comfort, fuel savings; for increased profits from farm stock.

See your building supply dealer for FREE estimate on how much Zonolite Concrete Aggregate you'll need for your job.

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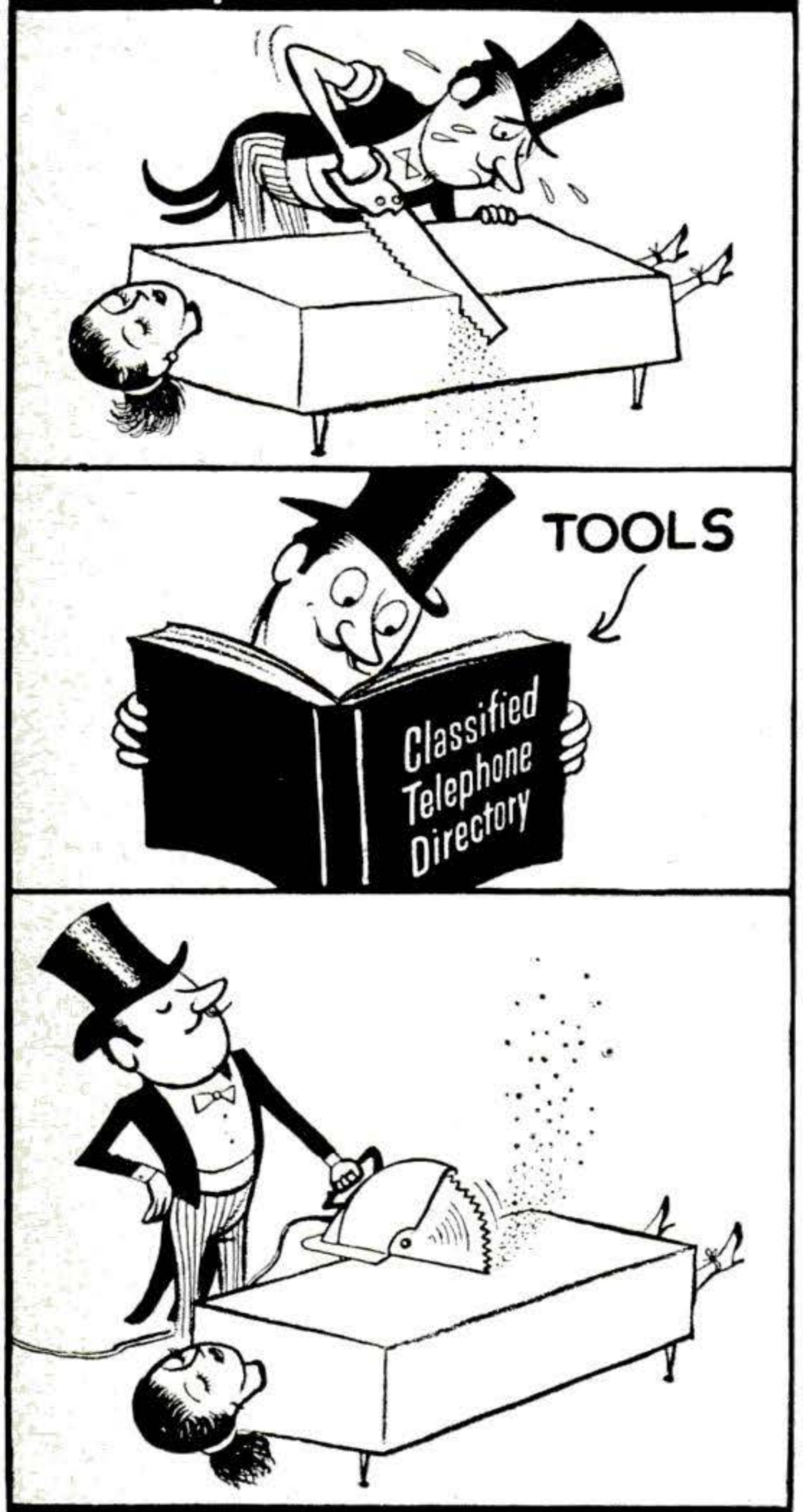

FOR ALL HOME WORKSHOP EQUIPMENT

LOOK IN THE

'YELLOW PAGES'

OF YOUR TELEPHONE DIRECTORY

New Calendar in 1961?

[Continued from page 113]

to talk like you if you change sounds every time you open your mouth? Nobody knows why this happens, but there are machines now that can measure it. A few years ago you said "secretary." Now, even if you pride yourself on correct speech, you say "seketary" oftener than you think. Some day it may be "sektary."

To get at such problems, linguists are now trying to split the atoms of your speech. Some day these "nuclear linguists" may know more about why you say "glass of beer" and a South German says "class of peer." When we get that far we may be on the way toward a world tongue.

Until then, Columbia's Dr. Eugene Dorfman thinks the best idea—to help world understanding—is for us all to learn two or three foreign tongues.

AND UV KOURZ, there's always simplified spelling. You haven't bin hearing much about it lately, but the spark goze on.

It may come, in time. In fact it's already sneaking up on us. You can't hurry it. Back in 1906 Teddy Roosevelt tried to jam through 300 changes in Government spelling. He wanted ***harbour*** shortened to ***harbor,*** and ***though*** spelt ***tho.***

An outraged Congress rebelled.

But do you know what has happened? Today the dictionaries have adopted 150 of those spellings. You've adopted them too. Today, who writes ***harbour*** for ***harbor?***

And so some experts think it's time to fix up another list.

But in the meantime

SEE WHAT'S HAPPENING

to reading!

Just between us, your family doctor is in trouble. So are docs in England, Pakistan, Russia and Uganda. They can't keep up to date because they're swamped with reading. New developments come every day. It's true of your lawyer, your G man, your kids. Even your wife—***all those new household ideas to read!***

[Continued on page 260]

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Guaranteed by Good Housekeeping
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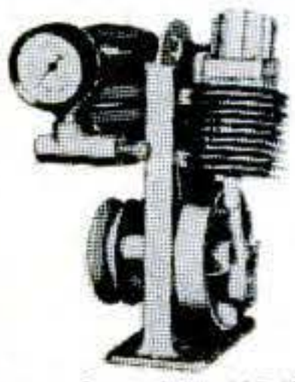

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Women can operate it. Free Catalog. Write ESHELMAN, Dept. R-41, 109 Light St., Balto 2, Md., 333 N. Michigan Ave., Chicago 1, Ill., 7070 Hollywood Blvd., Los Angeles 28, Calif.

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With the New LEVELALL one man can do the work of two men and a transit, quickly, easily, accurately. All alone you can speedily level points for footings, forms, piping, batter boards, sills, lintels, floors, ceilings, roads, driveways, lawns — any type of construction work. Send for Free booklet or, better yet, order a DeLuxe Levelall today.

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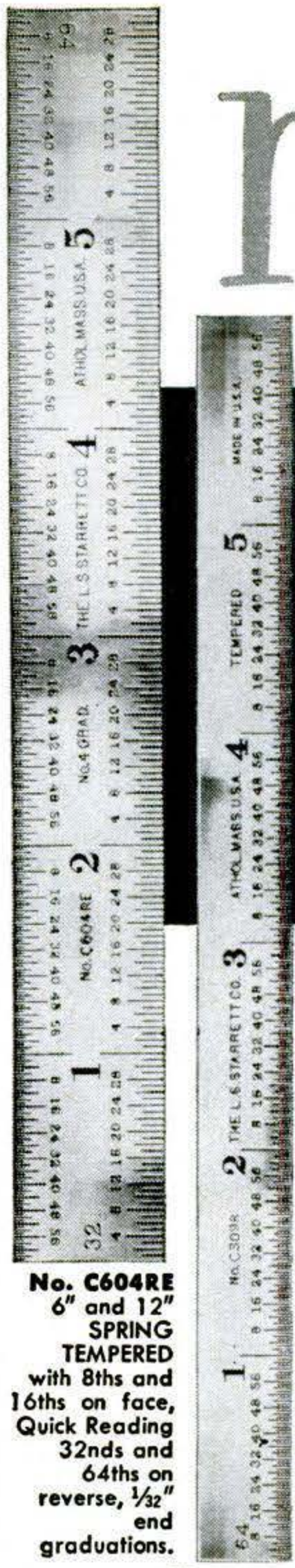
☐ Mail 75' DeLuxe Levelall @ $12.95 ☐ Regular 50' model @ $9.95 ☐ Ship postpaid full price enclosed ☐ Ship C.O.D. Money-back satisfaction guaranteed.

LEVELALL 81-A Webster Street, Rockland, Mass.

new!



No. C604RE 6" and 12" SPRING TEMPERED with 8ths and 16ths on face, Quick Reading 32nds and 64ths on reverse, 1/32" end graduations.

No. C309R 6" FULL FLEXIBLE with 16ths and Quick Reading 32nds on face, Quick Reading 64ths on reverse.

Starrett STEEL RULES with no-glare *Satin Chrome* finish

All the advantages of *Satin Chrome Finish*, pioneered by Starrett, are now available on two new Starrett steel rules.

No-glare, hard wearing, multi-plate *Satin Chrome Finish* makes it easy to read the rule at any angle, in any light; speeds up readings; eliminates eyestrain; helps avoid errors. It also resists moisture, acids, perspiration, rust and stains.

Available through your Starrett distributor in two types — *full flexible* and *spring tempered*. Write for descriptive folder No. 322. Address Dept. PS.

SEND FOR IT — ONLY 10¢
Starrett "Tools and Rules" Book

50 page booklet shows the right tools for any precision measuring job. 100 pictures plus helpful reference tables. Send only one dime. Address Dept. PS.

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TRADE MARK Starrett REG U S PAT OFF

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WORLD'S GREATEST TOOLMAKERS

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
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Motorists prefer FRAM more than 2 to 1

Surveys prove it . . . and in many cases the preference for FRAM Oil Filters more than equals the preference for the *next two most popular brands combined!*

Here's why: FRAM is engineered for *extra-high* filter efficiency . . . *keeps* oil clean, cuts wear, saves power and reduces repair bills.

There's a FRAM Cartridge engineered for your car. See your FRAM Dealer today!

Send FRAM boxtop or 25c for big, colorful, 68 page *Vacationland America* Book describing motor trips throughout America!

FRAM OIL • AIR • FUEL • WATER FILTERS

FRAM CORPORATION, Providence 16, R. I.
Fram Canada Ltd., Stratford, Ont.

New Calendar in 1961?

[Continued from page 258]

So now
they're teaching
people like us
To read faster
BY GROUPING OUR WORDS
in bunches.

This kind of thing is called "idea grouping." But there's an even faster way:

This kind of reading	is called "square span"	because it lets your eyes
work rapidly in squares	rather than single lines.	They can work up and down
as well as sidewise.	And so they take in more	at a single glance.

New devices of this sort, says Director Ken P. Baldridge of New York's Reading Laboratory, can speed up the world's reading by 50 percent. Today they're even teaching bank clerks to read checks faster!

ALL THESE THINGS—and others to come—are newcomers in a speed-up-and-standardize process that began long before calendars.

You can trace it all back to the day Joe Caveman's wife borrowed a new recipe from Aunt Jennie Stoneage who lived in a hole on the other side of the cliff. Mrs. C. liked the new recipe better. It was quicker. The neighbors liked it, too. Soon the whole cliff was using it.

Presto—*standardization!*

You may—or may not—like all this standardization. World friends or not, maybe you don't *want* your birthday always on Tuesday, or the Fourth of July on Wednesday!

Maybe you *like* variety—and a little uncertainty. If so, you're no different from a lot of other normal people. Yet the weight of history has always been in favor of standardization.

And the weight of dollars and cents, too. As long as we like to eat three times a day, economic pressure for standardization will go on.

After all, isn't *three meals a day*—by any calendar—the granddaddy of all standards? END

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Wonder-Paste is different. Takes the hard work out of removing varnish, paint, enamel, etc. Finish comes off easily—not coat by coat, but in one scraping. Use it on furniture, trim, floors, etc. At paint and hardware stores.

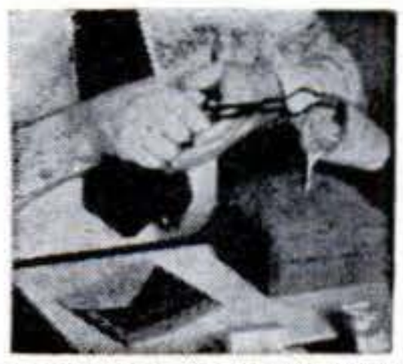
• *Write for leaflet—and advice on your removing problem.*

WONDER-PASTE

Wilson-Imperial Co., 121 Chestnut St., Newark 5, N. J.

'55 FORD

... the fine car of its field!



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Schools and Home Workshops

Make your own castings of aluminum, copper, bronze, silver. Foundry sets are available in three sizes including 2400 Deg. F. blast Furnaces, $22.50; $29.50; and $42.00 f.o.b. Kansas City. Free Circular.

KANSAS CITY SPECIALTIES CO. P. O. Box 6022, Dept. S-1 KANSAS CITY, MO.

$6.95 DRAINS cellars, cisterns, wash tubs; **IRRIGATES - CIRCULATES - SPRAYS**

1,001 USES—HOUSE, GARDEN, FARM

Original All-Purpose Pump has 2400 GPH capacity, 360 GPH 75' high; or 1500 GPH from 25' well. Use any 1/6 to 3/4 HP motor. Stainless steel shaft. Oil-less bearing. 1" inlet; 3/4" outlet. Motor coupling included.

DOES NOT CLOG OR RUST

Postpaid if cash with order. (West of Miss. add 50c.) MONEY BACK GUARANTEE. Larger Centrifugal Pumps, and Gear Pumps in all sizes.

LABAWCO PUMPS, Belle Mead 3, N. J.

BUILD YOUR OWN ARC-WELDER FROM AIRCRAFT GENERATOR

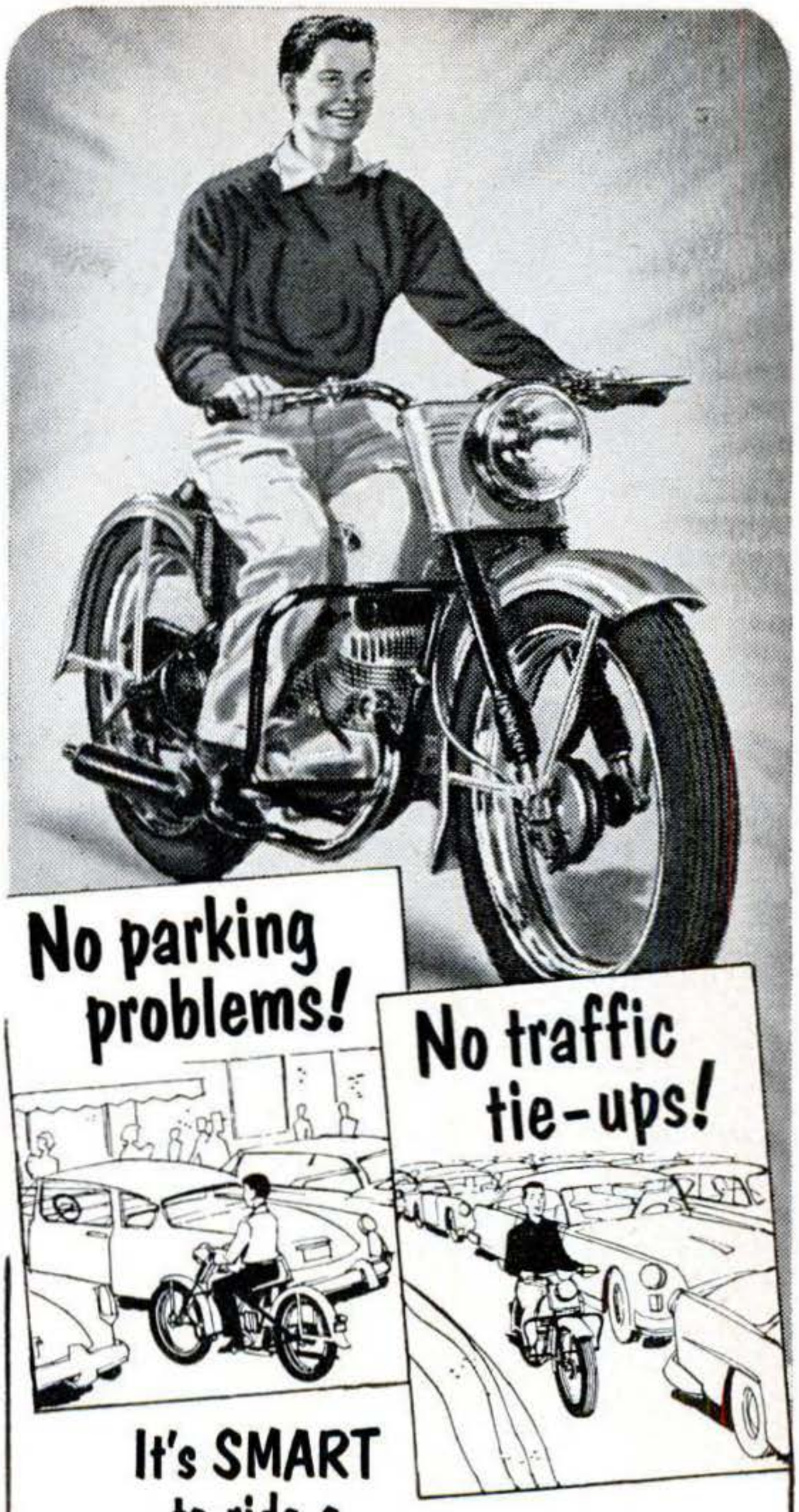
For Light or Heavy Work

We show you how to build this NEW powerful welder without rewinding. Uses most any surplus aircraft generator. Produces 75-300 amps. Easy to build. Complete **PLANS 35c.** Send today & we'll include **FREE** our **Big War Surplus and Electrical Catalog.**

LEJAY MFG. CO., 1223 LeJay Bldg., Minneapolis 8, Minn.

"TOOL SHADOWS" show where your tools belong

"TOOL SHADOWS" are full-size die-cut shadows of your tools with pressure-adhesive on the back, so they stick to any surface. They dress up your workshop, make it look neat and organized. Send $1 for complete set of 42 basic "Tool Shadows" to: TOOL SHADOWS, Dept. S, 109 East 81st St., New York 28, N. Y.



It's SMART to ride a

Harley-Davidson 165

NO PARKING AREA'S SO CROWDED that there's no room for this All-American lightweight. Small and compact, the 165 parks in small spaces anywhere.

NO ROAD'S SO CROWDED that you can't thread through every traffic jam. This peppy two-wheeler is easy to handle . . . safe and economical, too. Small wonder the Harley-Davidson 165 is called the world's most practical transportation.

See the 165 and other Harley-Davidson models at your dealer's. Easy pay plan. Send for *FREE* illustrated literature. Harley-Davidson Motor Company, Department PS, Milwaukee 11, Wisconsin.

AVERAGES UP TO **80** *Miles per Gallon*

SAFE, ECONOMICAL TRANSPORTATION FOR EVERYONE!

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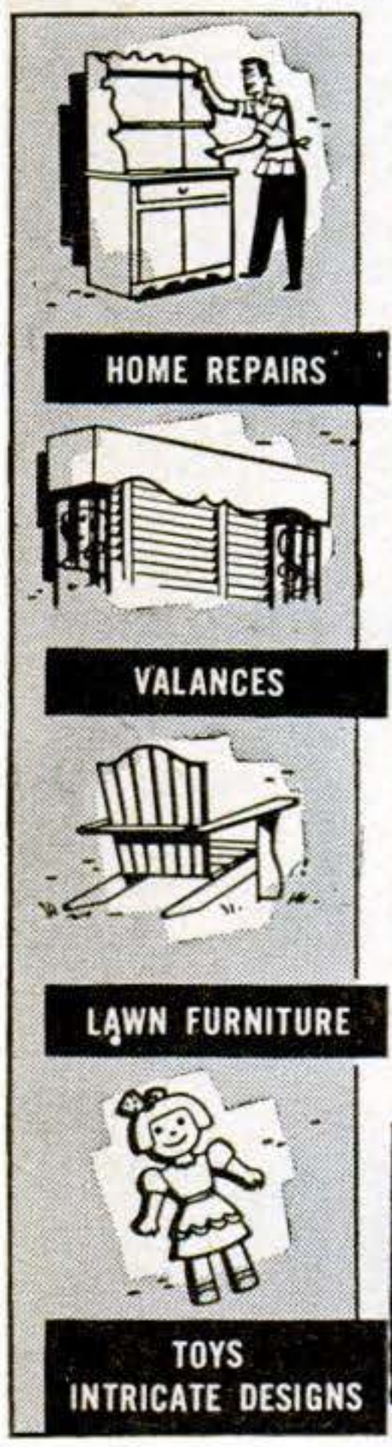
YOU NEED THIS POWERFUL NEW JIG-SAW for DO-IT-YOURSELF JOBS
Valances, Lawn Furniture, Intricate Designs, Toys

SAFE FOR ALL AGES

No. 208



Yes ...it cuts 2x4's

New Syncro No. 208 is the only self-powered jig saw to offer you **ALL** these important features: **1.** Cuts 1¾" wood. **2.** Cuts to center of 30" circle. **3.** 100 square inches of working surface. **4.** Adjustable arm permits cutting *any* length. **5.** Safe for every member of the family. **6.** Motor guaranteed against burn-out during ownership. **7.** Cuts smooth edge—no splintering—no sanding needed. **8.** Cuts with same blade: wood, plastic, metal (ALUMINUM, etc.), linoleum, leather, etc. Send coupon for FREE Catalog. *Remember:* MORE SYNCRO-MADE JIG SAWS HAVE BEEN SOLD THAN ANY OTHER SELF-POWERED MAKE!

NEW 208 CUTS MORE MATERIALS FASTER THAN ANY OTHER Self-Powered JIG SAW!

SYNCRO QUALITY TOOLS

SYNCRO Electric QUALITY DO-IT-YOURSELF TOOLS

SEND POSTAL FOR LOW PRICE AND FREE CATALOG!

SYNCRO CORPORATION
DEPT 2-15
OXFORD, MICHIGAN
U.S.A.

Send Free Syncro Catalog of Jig Saws, Sanders and Free 8-page "Sanding Handbook".

Name.....

St. & No.....

City.....State.....

New Treatment Cures Black Eyes

[*Continued from page 120*]

flammation, swelling and hemorrhage, brought on by serious eye diseases. Sudden loss of vision, caused by hemorrhages of the retina, has reacted quickly to this treatment in a few cases.

Treatment Puts Bruises Back in Pink

Not only eye injuries and diseases but also severe bruises of other kinds are responding to Parenzyme. When any of the body tissues are struck with great force, there is painful bruising. First the skin reddens and the tissues swell; then, as the blood pours out of the blood vessels into the skin, the tissues turn black and blue.

Circus performers—tumblers, acrobats and the pretty girls who suffer leg injuries while riding elephants—recover quickly from ugly bruises when treated with trypsin. An elephant stepped on one circus man's foot, leaving a swelling the size of a baseball on his ankle. Ordinarily this injury would have taken nine to 10 days to heal. With intramuscular trypsin injections the man went back to work in three days.

Rodeo performers, too, often have painful contusions which trypsin helps. The half-wild horses bite their riders and trainers. The noncarnivorous horse hasn't a strong jaw; his bite is likely to leave a contusion rather than a laceration. But a bite on the shoulder or nape of the neck (the horse's favorite spots for attack) can cause a bad bruise, even if it doesn't draw blood.

Keeps Other Chemicals Working

Trypsin has been under scientific investigation for several years. In the human body, it acts as a catalyst to stir the reactions of other body chemicals which are necessary to life. It is one of dozens of enzymes at work in the body.

At first, trypsin was used chiefly to dissolve dead tissues around wounds and burns, and to clear up pus in chest infections. But researchers knew that trypsin would dissolve protein. Blood clots

[*Continued on page 264*]

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Famous MZB German Precision Calipers & Micrometers

UP TO HALF REGULAR PRICE

30-61 Chrome Steel Caliper .001" & 1/128" $7.00
with Cam Lock

30-78 Chrome Steel Caliper .001" & 1/128" 6.00
with Set Screw

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Add 35c for postage—No C.O.D.

MONEY BACK GUARANTEE

Genuine Leather Case for above caliper 75c each

INTER-CONTINENTAL TRADING CORP.
90 WEST STREET NEW YORK 6, N. Y.

Liquid WRENCH

Loosens Rust, Corrosion Instantly
Cleans, Protects Fine Finishes
Quickly Frees 'Frozen' Parts

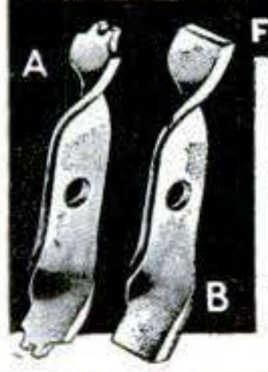
A powerful blend of quick-acting solvents, Liquid Wrench acts fast, yet is absolutely safe for all metals and alloys. Permits easy separation of rusty, corroded parts without breakage. Excellent for cleaning clocks, guns, typewriters, locks, fishing rods, reels, sports equipment of all kinds. A handy product of 1001 uses. Keep a can handy in the house, workshop, office and car.

3 OZ. CAN 30¢

At Hardware Stores, Service Stations, Plumbers
made by **RADIATOR SPECIALTY CO., Charlotte, N.C.**

USE YOUR BENCH SAW

FOR JOINTING & CUTTING MOULDINGS



With our six inch tool steel cutters you can make beautiful mouldings for picture frames, furniture, and house construction. Cutters as shown,

DIRECT FROM FACTORY!

One inch wide—$1.98; 1½ inch wide—$2.49 ea. Postpaid. Guaranteed. List & Folder free. State hole size.

JOHN A. SANDSTROM
Rt. 2 P. Clearwater, Fla.

Print Your Own

Cards, Stationery, Advertising, labels, circulars, photo and movie titles, church work, tags, etc. Save money. Sold direct from factory only. Raised printing like engraving, too. **Print for Others, Good Profit.** Have a home print shop. Easy rules supplied. Pays for itself in a short time. Write for free catalog of outfits and all details.

KELSEY PRESSES, N-33, Meriden, Conn.

SPRINGFIELD 2-WHEEL

TRACTOR

Finest tractor on 2 wheels. 3 h.p. engine. Positive reverse. Perfect balance. Welded frame. All attachments. Other tractor and tiller models described in free catalog.

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Quick Mfg. Inc., 3256 E. Main, Springfield, Ohio.

PUMP WATER *FAST!*

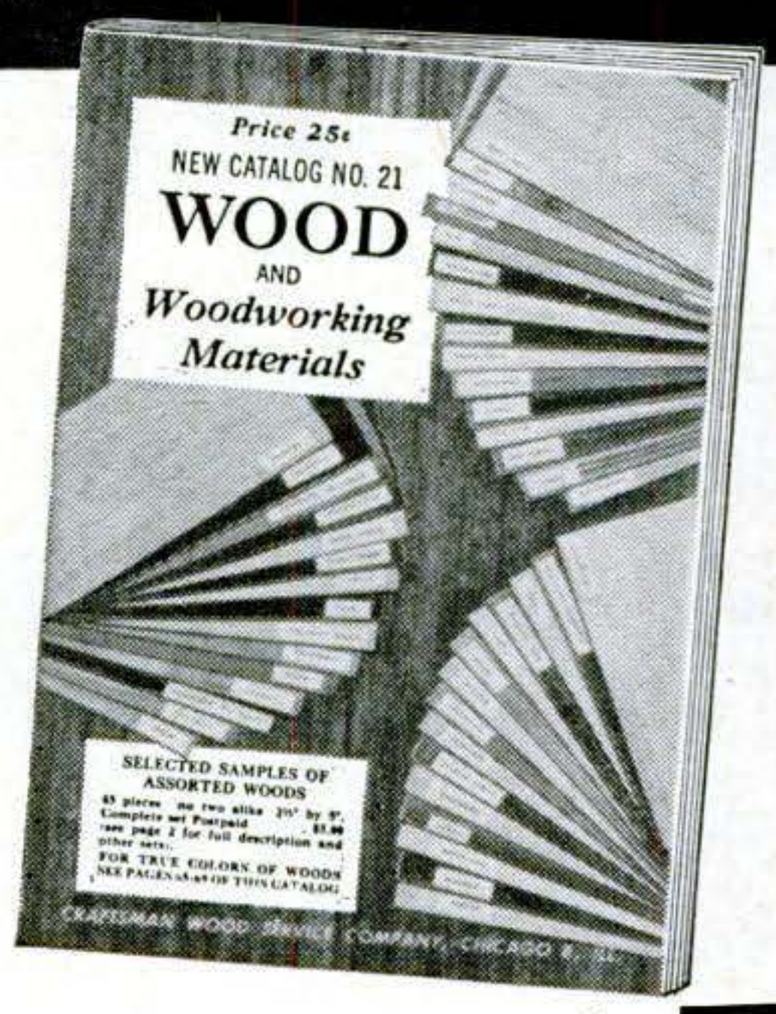
Drains Wash Tubs, Cellars, Cisterns. Famous #7 pumps 2800 gph. 420 gph. at 75' high or 1600 gph. from 25' well. Sturdy rustproof alloy metal. Six blade impeller. ¾" inlet, ½" outlet. Standard pipe threaded. Uses any ⅛ to ½ H. P. Motor. Will not leak or clog. Ironclad guarantee. Send check, M.O., or sent C.O.D. **$8.95** IN U.S.

Irrigate, Fill Tanks, Draw Well Water. Heavy duty #8 pumps 7000 gph. —1000 gph. 75' high 3000 gph. from 25' well. Rustproof alloy metal. 8 blade impeller. 1" inlet, 1" outlet. Standard pipe threaded. Will not leak or clog. Iron clad guarantee. Send check, M.O., or sent C.O.D. **$11.95** IN U.S.

Free Catalogue—Gear Pumps, Large Centrifugal Pumps, Deep and Shallow Well Pumps, Sump Pumps.

MOORE MANUFACTURING CO.
SWEDESBORO 2 NEW JERSEY

Get This NEW 1955 Craftsman Catalog of WOOD AND WOODWORKING TOOLS AND EQUIPMENT



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Enclosed find 25c. Rush me new WOODWORKERS CATALOG HANDBOOK.

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SURFWOOD comes in 4′ x 8′ panels, 5/16″ thick. Open and sound knotholes add to its picturesque, weathered appearance.

Beautiful new wall paneling looks like weathered driftwood—install it yourself at low cost*!

SURFWOOD texture is produced by special process that etches away the soft wood tissues between the hard grain.

PANEL YOUR DEN with the clean-swept look of the sea! With Surfwood, you can transform a whole room or make a good-looking hobby nook in your living room or bedroom. Surfwood's large panels go up easily right over existing walls. Nail holes are hidden by Surfwood's irregular surface.

SURFWOOD can be finished to give a wonderful variety of effects: it can be stained any color, finished natural with Satinlac, pickled with white Firzite, or even rubbed with dry pigment to give a modern two-tone look.

SEE SURFWOOD at your lumber dealer's or at any one of the 73 United States Plywood or U.S.-Mengel Plywoods showrooms located in principal cities.

*An 8′ x 12′ wall costs only $23; prices vary slightly in different areas.

SEE YOUR LUMBER DEALER

Weldwood®

REAL WOOD PANELING

United States Plywood Corporation

WORLD'S LARGEST PLYWOOD ORGANIZATION

Weldwood Building, 55 W. 44th St., New York 36, N. Y. and U. S.-Mengel Plywoods, Inc., Louisville, Kentucky

New Treatment Cures Black Eyes

[Continued from page 262]

are composed largely of protein, so they hoped that trypsin would dissolve the dangerous clots that cause coronary thrombosis and, in many cases, death. But even with large doses of trypsin, the ability of the enzyme to dissolve blood clots was not proved. Although inflammation and swelling went down quickly, the blood clots dissolved very slowly.

So, the researchers emphasize, *intramuscular trypsin is not an anti-coagulant;* it is not a substitute for heparin, dicumarol, tromexan and other anti-blood-clotting medicines that doctors give to patients suffering from blood clots. Moreover, Parenzyme can be used, *in the recommended* tiny doses, where the anti-coagulant drugs cannot, as in hemophilia, the tendency to bleed too easily.

Relieves Painful Inflammation

On the other hand, there is no doubt that Parenzyme does a great deal of good in the early stages of thrombophlebitis, an inflammation of the veins accompanied by blood clots. In hundreds of cases of this disease, injections have relieved pain, tenderness in the calves of the legs, and swelling.

Just how Parenzyme works, scientists are not sure. More than 100 clinical researchers are working with biochemists and pharmacologists to find the answer. Meanwhile, trypsin will go on working safely and effectively at its new jobs. END

What Are Your Chances?

The chances that you will marry a girl with whom you went to school are one in 70.

The chances that you can disappear and never be found are 1,000-1 against you.

The chances of getting good news in a telegram instead of bad news are 2½-1.

If you are married, the chances are 2,300-1 that you met your wife through an introduction.

The chances are 7-1 that your first married argument will concern money.

And . . . your chances of living to a ripe old age are immeasurably increased if you follow common-sense rules while at work, in traffic and at home.—*Grumman Plane News.*

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ALL ITEMS BRAND NEW

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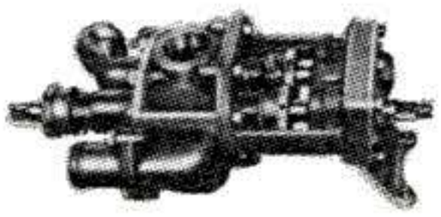
ITEM #383—USE FOR:
● Sprinkling ● Irrigation ● Insecticide Spraying ● Sump Pump ● Fuel Transfer ● Home Water Systems ● Dewatering ● Salt Water, Chemical, Acid Pumping ● Circulating Pump ● Cooling Tower.



FEATURES ● Needle Bearing Construction ● 1½" Pipe Thread Inlet, 1¾" Hose Outlet ● Standard ¾" Keyed Shaft ● All Bronze Body & gears, Monel Shaft ● Equipped with Drain Cocks, Grease Cup, Steel Internal Drive Gears for long, trouble free service.

CAPACITY: From 10 to 80 Gal. Per Min. At Speeds from 550 to 2400 Rev. Per Min. Using from ½ to 6 Horse Power. For Pressures to 60 lbs. Ship. Wt. 58 lbs. U. S. Navy Cost $168.00.

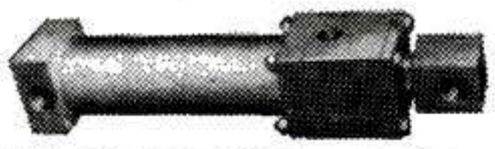
F.O.B. Chicago. **39.50** Ea. Two for 75.00

PESCO GEAR TYPE

HYDRAULIC PUMP

Compact — Powerful — Reliable

ITEM #160—Especially designed for belt drive from fan belt, power take-off, drive pulley, electric motor or small gas engine. Equally suitable for direct coupling. Pedestal type mounting with two bolt holes for ⅜" hold-down bolts. Standard ½" pipe thread inlet and outlet ports. Delivers 4.5 GPM at 1000 PSI at 2800 RPM with 4 HP. Hardened steel gears turn in dense oilite bronze bearings. Rotation—clockwise facing shaft. Guaranteed trouble-free service. Ship. wt. 6 lbs. F.O.B. Chicago **22.50**



ITEM #41C1C ● 2" Bore ● 6" Stroke ● Double Acting ● All Steel ● ⅜" Pipe thread ports. Lift capacity 3100 lbs. with 1,000 P.S.I. line pressure. Ship. wt. 12 lbs. F.O.B. Chicago. Price ea. 12.50

ITEM #16-C—1½" bore, 26" stroke. Will lift 1760 lbs. with 1000 lbs. pump pressure. Great for hay loaders, etc. 1" stainless steel piston rod. Postpaid.... **16.95**

A. C. ELECTRIC GENERATOR

7½ K.W. (7500 WATTS) single phase, 110/220 volt output. 3 wire system. 2 bearing construction. 5 groove 6" V belt pulley included. Self-excited. Foot mounted. Drive generator from tractor or stand by engine. Ample power for 6 room house. Dimensions: 34" x 11½". Shipping Wt. 420 lbs. F.O.B. Chicago..... **295.00**

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SAVE $30.30 ON THIS PESCO

HYDRAULIC CONTROL VALVE

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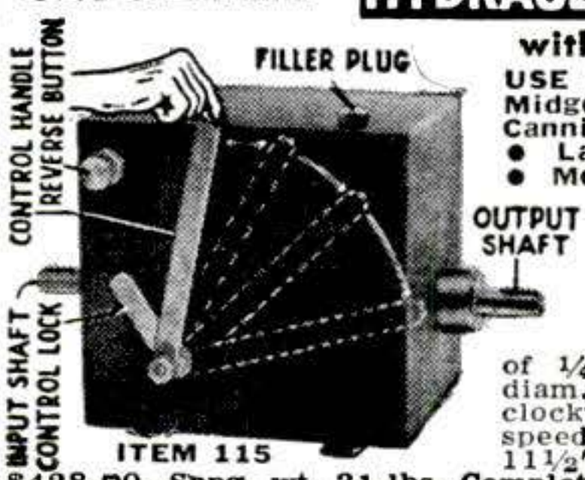
FOR SAFE POSITIVE CONTROL OF HYDRAULIC CYLINDERS AND MOTORS — ● BUILT-IN RELIEF VALVE—factory set at 1200 P.S.I. ● FOUR WAY VALVE—to operate one double acting cylinder ● OPEN CENTER—with valve in neutral, cylinder is locked in position and pump is unloaded. ● SPRING RETURN TO NEUTRAL ● FULLY BALANCED PLUNGER ● EASILY STACKED INTO 2, 3, or 4 valve combinations for multiple cylinder operation. ● 8 gal. per min. capacity, at 1500 P.S.I.—⅜" pipe ports. ● CONNECT PUSH RODS TO HANDLE FOR REMOTE CONTROL. ● EASY MOUNTING ● LIST PRICE—$46.80. ● YOU SAVE $30.30. ● DIMENSIONS—9"x4½"x2½"—Ship. Wt.—8 lbs..... **16.50** F.O.B. Chicago

GROBAN HYDRAULIC SPEED REDUCER

with FINGERTIP CONTROL



ITEM 115

USE FOR: ● Reamer Drives ● Midget Cars ● Feed Mills ● Canning Machines ● Conveyors ● Lathes ● Milling Machines ● Motor Boats ● Cream Separators ● Garden Tractors ● Pumps. Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of ¼ to 1½ H.P. Shafts ⅝" diam. Input rotation counter-clockwise facing shaft. Input speed 750 R.P.M. 7½"x7½"x11½". Gov't acquisition cost $428.00. Shpg. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago..... **54.50**

Brand New! 5-TON BLACKHAWK

HYDRAULIC LIFT KIT

The Complete Kit NOW ONLY **44.45** complete

For — ● Dumping farm wagons ● Adjusting depth of plows ● Hydraulic press ● Hydraulic jack ● Snow plows.

KIT CONSISTS OF:

1—Brand new Blackhawk Model P-151—Hydraulic hand pump with built-in oil tank and release valve. Rated from 1200 P.S.I.—to 8400 P.S.I. 20" handle. Dim. 8"x6"x6"
Item #82.....22.50

1—6 Ft. length double wire braid rubber covered hydraulic hose—tested to 20,000 lbs.!
Item #27B4.....3.95

1—Hydraulic cylinder, 2½" bore. 7½" stroke. 1½" stainless steel shaft, will lift 10,000 lbs., using pump pressure. Standard clevis mounting. May also be used for double action service.
Item #355A.....17.00

2-Qts. non-foaming hydraulic fluid.....1.00

All necessary hydraulic fittings.
Total ship. wt.—40 lbs.

COMPLETE KIT PRICE..... $44.45
ALL OF ABOVE INCLUDED F.O.B. Chicago

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NEW MODEL 353

ITEM #65 For Stationary or Portable Use. HEAVY DUTY RANGE to 250 AMPS.

Ideal for
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Welds Anything From Auto Fenders To Tractor Frames

● Dial Type Rheostat Control
● Uses 1/16" to 1/4" Rod
● Generator-type Welder
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● Use 7½ H.P. Electric Motor or 10 H.P. Gasoline Engine
● Run at 2500 R.P.M.
● Available with Either Flat Belt or Double V Pulley
● Complete Operating Instructions

Shipping wt. 107 lbs. $350.00 Value.
Standard Model F.O.B. Chicago..... **99.50**
Deluxe Model—with "Magic Terminal" for low amperage range welding. (Between 30-100 amps.) F.O.B. Chicago.. **119.50**

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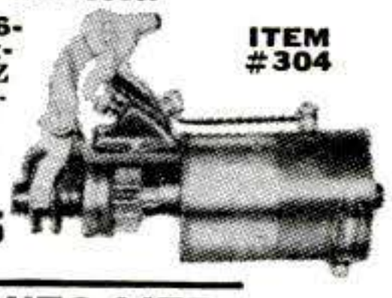

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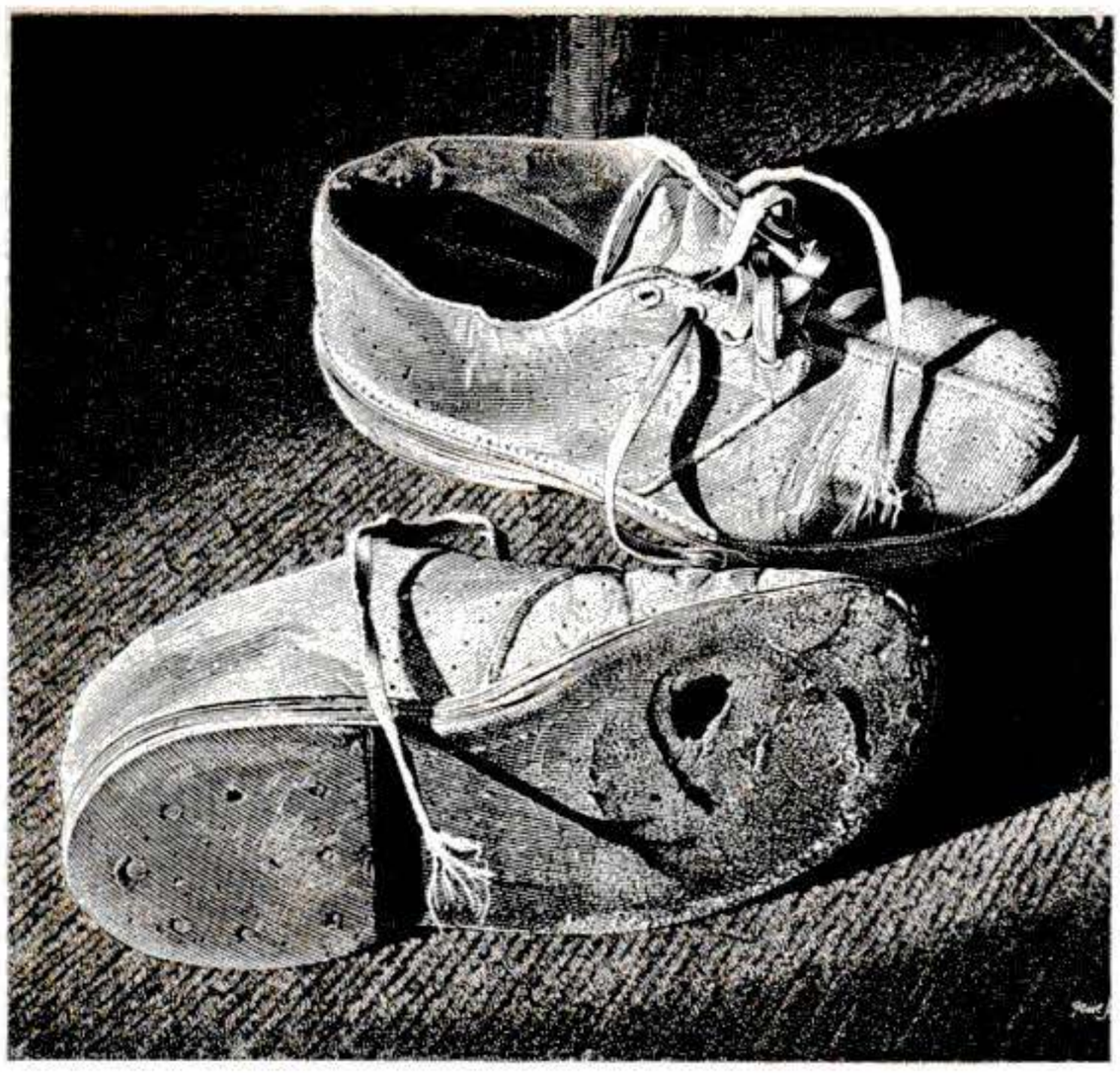

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HASTINGS
STEEL-VENT PISTON RINGS
Regular or Chrome

Tubeless Tires

[*Continued from page 153*]

tire and a worn one than there is between a new tubeless tire and one with a tube.

Inspect them regularly! It takes know-how to install them—they can be injured in the process. And it takes know-how to repair them.

To take tubeless tires, rims must be perfect. That's because retention of the air depends on a perfect seal between tire bead and rim. Damage a rim, and your tire probably will go flat.

Because tubeless tires will "absorb" a nail, it's possible to drive several thousand miles without realizing your tire is punctured, and thus do permanent damage to it. For this reason, tubeless tires should be carefully examined at least every 3,000 miles.

> ***All the country needs to reduce accidents is a pedestrian who can run faster than an automobile.***
>
> —THE SIDEWALK SUPERINTENDENT

Prices on tubeless tires as original equipment are the same as those of comparable tubed tires. Replacement tires in some instances run a little higher. Here are some sample factory-recommended retail replacement prices on the 6.70-by-15 tire, the most-used size, as produced by Goodyear:

Plain black, rayon—$27.20; white sidewalls, rayon—$32.55; black, nylon—$33.85; white sidewalls, nylon—$40.65; an extra-heavy, deep-tread nylon available only in white sidewalls—$56.55; black, rayon, snow tread—$29.60; white sidewalls, rayon, snow tread—$35.50. Add $1.24 as federal tax.

The extreme range in prices on tubeless tires sized 6.70-by-15 made by U.S. Rubber is $27.20 to $32.55; that by Goodrich, $27.20 to $52.53, and by Firestone, $27.20 to $62. Prices on tires made by other companies are about the same.

The five percent boost in tire prices by the industry last November applied to tubed and tubeless tires alike. END

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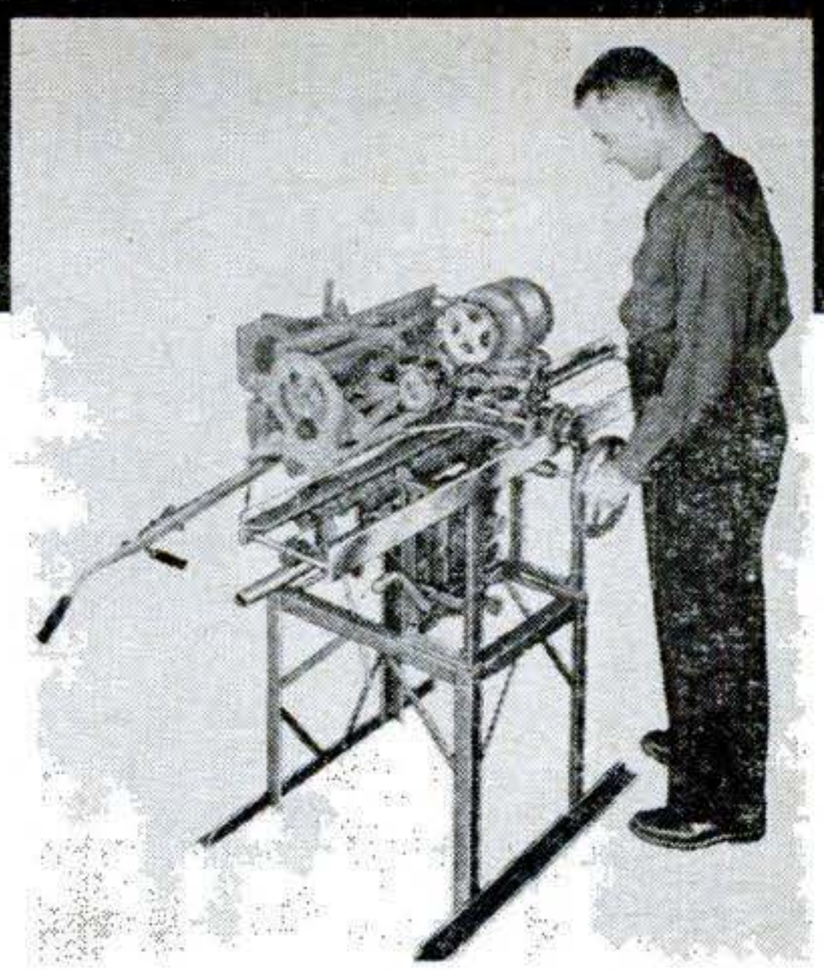

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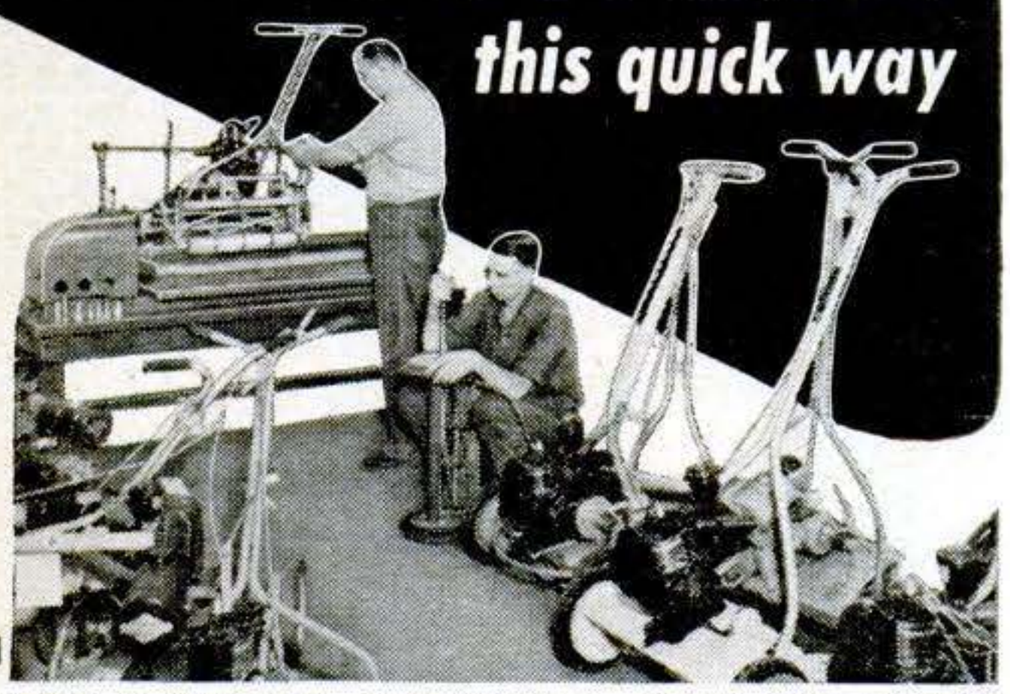

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Sports-Car Maker Tests New Ideas

[Continued from page 157]

No. 1 split-axle design. He also had some assorted parts from a Bugatti: tail, pointed gas tank, steering column, cockpit. These pieces, plus a few others, were put together to make a racer known as the CLK5.

This mongrel beat most of the cars pitted against it, including many sleek thoroughbreds. It won nine awards in a row, but came to a sad end. Allard tried to take it to the top of Ben Nevis, Britain's highest peak, on roads that no self-respecting goat would attempt. "It was a most interesting climb," an observer reported, "somewhat abruptly terminated when the car turned over."

From Race Track to Showroom

Allard, unhurt, went on to build a lighter version of the smashed car and win more prizes.

Eight years ago, soon after the war, he started his own company to manufacture the sort of sports cars that you probably have seen—"more-or-less-standard models." Among American owners of the many Allards produced since then are a group of high-ranking Air Force officers, including Generals Curtis LeMay and Francis Griswold, and Col. Paul Tibbetts Jr., the man who dropped the first atom bomb.

As we approached London, I repeated a New York taxi driver's remark that sports cars are a traffic menace. They speed up suddenly, cut in on you and perform other unpredictable antics.

Allard suggested that taxi drivers, like other people, are often upset by things they're not used to. Few Americans have sports cars. But in London, and Britain generally, such cars are quite common and cabbies don't object to them.

While we were relaxing in the South London headquarters of the Allard Motor Company (a combination office, shop and showroom), Allard made it clear that as far as he's concerned the only car worth driving or talking about is a sports car.

[Continued on page 270]

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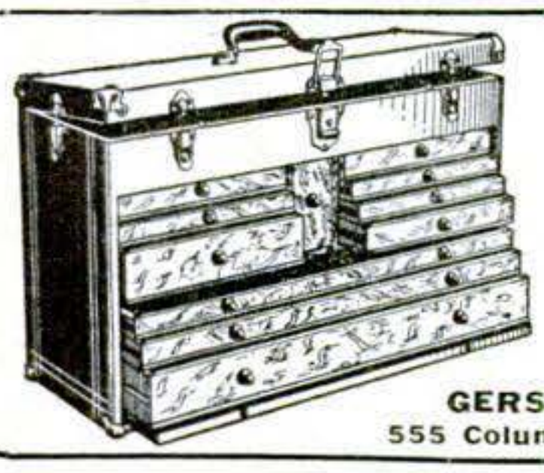

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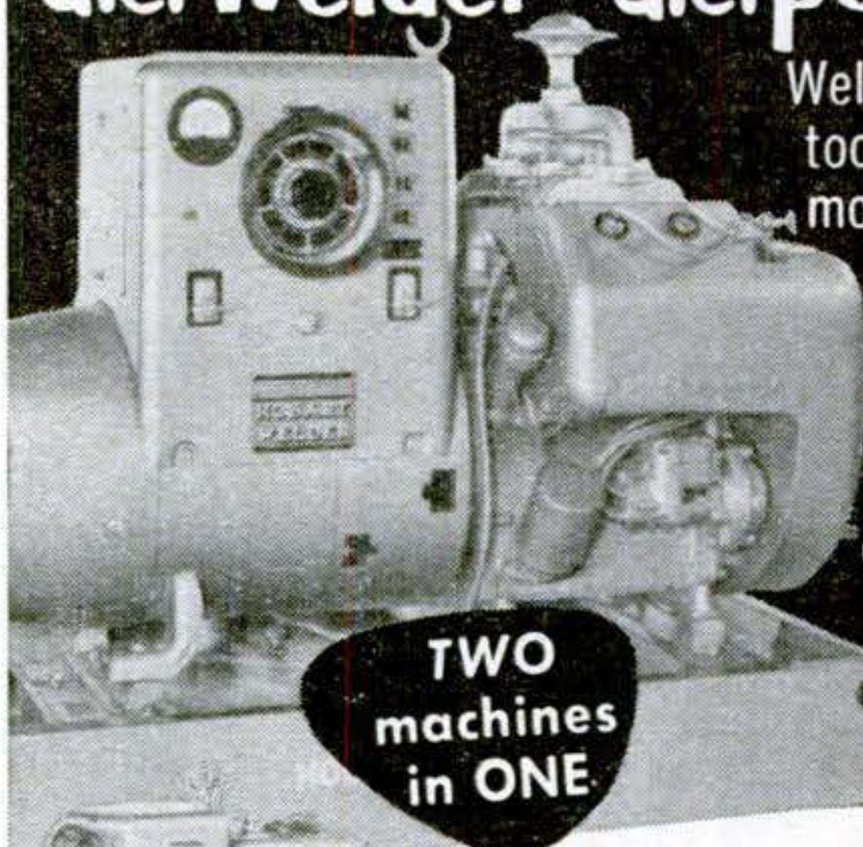

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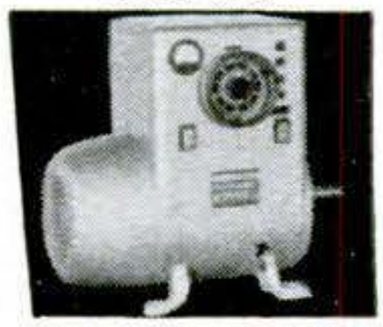

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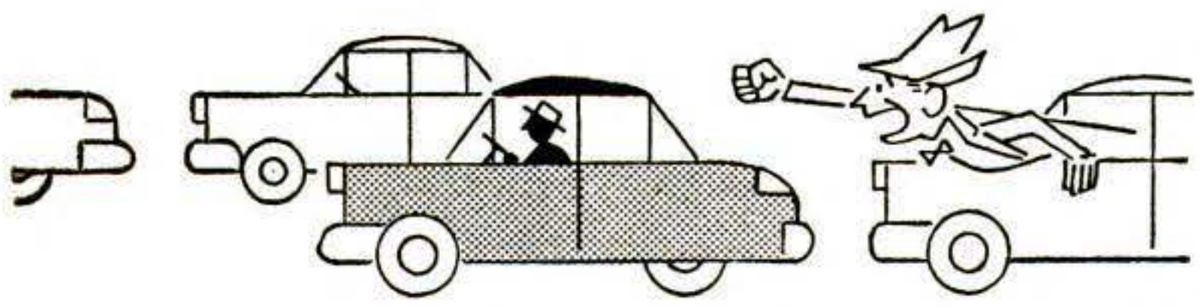
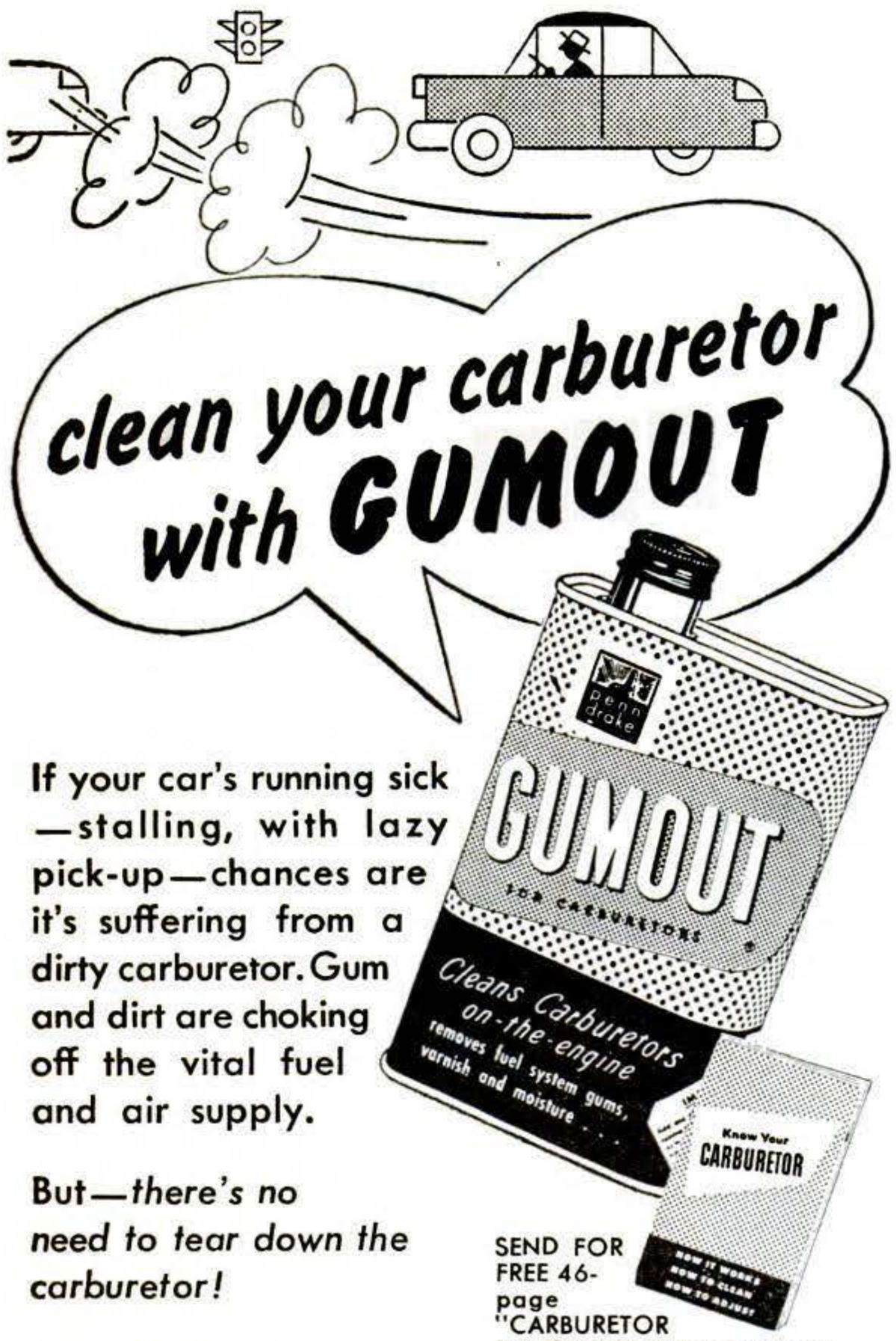


LAZY PICK-UP



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Sports-Car Maker Tests New Ideas

[Continued from page 268]

He doesn't like soft springs, which make for a "loose, spongy" ride. Soft springs contribute to that unsafe feeling on curves, by letting the chassis sway over to the side. Balloon tires produce similarly undesirable effects, although not to the same degree.

He objects to power steering, too, because there's no feel to it, and that takes some of the pleasure out of driving. "When drivers are out of touch with the road, their effective reaction times are slower," he argues. "That shows up especially in emergencies, and especially among below-average drivers."

Automatic transmissions? "In the States, I drove a Cadillac with automatic gear shifting. It's all right if you like that sort of thing. I thought it was sluggish."

Superchargers? "They're hardly worth the trouble. I'd rather build a big engine and be done with it."

It was getting late and Allard suggested we look over his headquarters before closing time. We went downstairs to see the "assembly line" in the basement. In a shop about the size of a small country garage, two veteran mechanics were working on a new K-3 model. They were tightening ball joints on the steering arms, and I had a chance for a close-up of a much-discussed type of front suspension. In all other cars the front axle is a single piece, running from wheel to wheel. In the Allard it's divided in the middle, forming two independent half-axles and providing independent suspension for each front wheel.

Wheel Digs In

The split axle, Allard says, helps insure smooth performance during high-speed cornering. In rounding a sharp curve, considerable centrifugal force is transmitted to the top of the outer front wheel. The wheel, already toed in slightly for better steering qualities, takes on an extra tilt. It digs sideways into the road, bracing itself against the

[Continued on page 272]

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• Air turbo solvent cleaner. Makes dirty, greasy parts shiny bright. 25" x 20" x 20" **$29.95**

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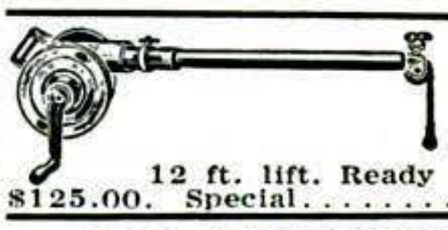

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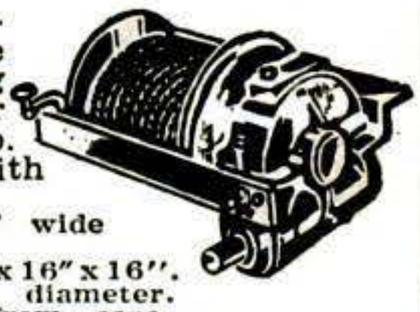

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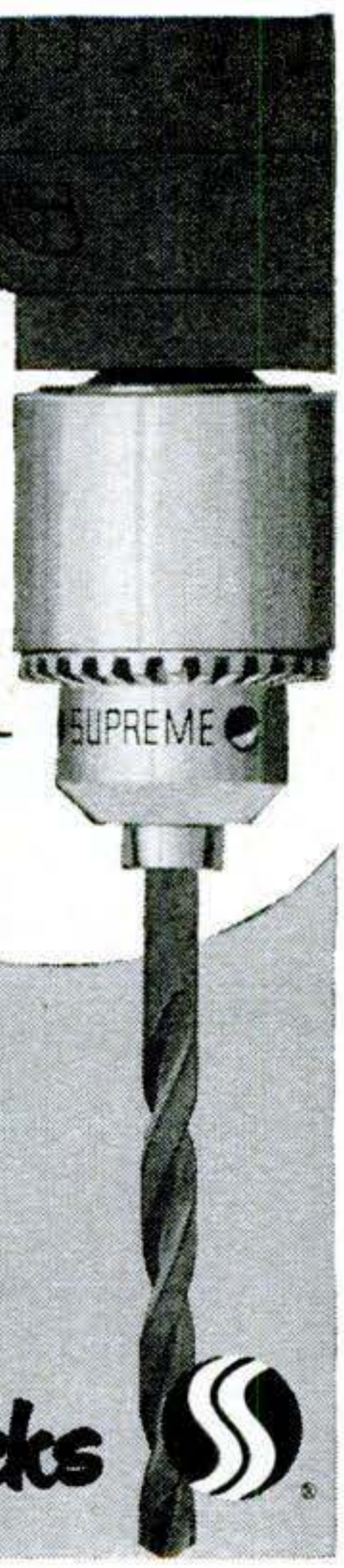

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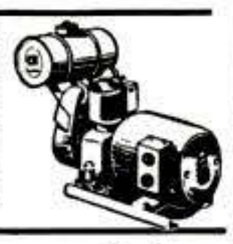

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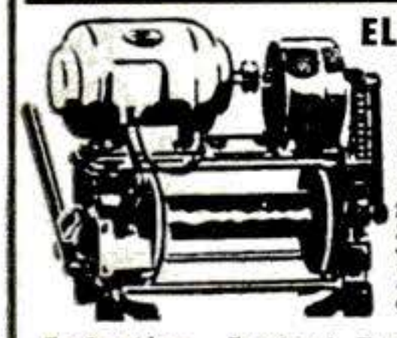

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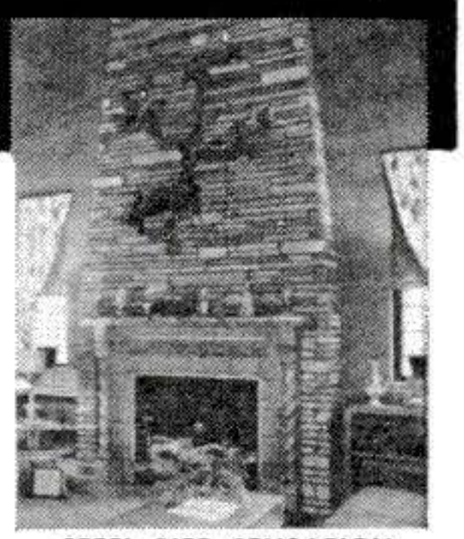

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Sports-Car Maker Tests New Ideas

[Continued from page 270]

ground and resisting the tendency to slide. Meanwhile the inner front wheel stays in its normal position, the car keeps steady, and you feel little side thrust.

Allard is still experimenting and keeping tabs on new advances. He's enthusiastic about power brakes, which are being supplied with some regular models. On racing and sports cars, he says, power brakes will make it possible to use harder brake linings. Such linings are much less subject to fading (loss of braking effectiveness under repeated use), but require more pressure than the unaided foot can apply easily.

Cymbals for Your Wheels?

Disk brakes are coming, too. They're arranged like a pair of cymbals, one on either side of the wheel, and work by pressing hard against the sides. "We're having some trouble getting rid of heat," he told me. "Lockheed is developing a new disk brake and we'll be testing it sometime this year. Fuel injection is also promising. It's the diesel idea, plus precision. If it works, you'll get better fuel economy."

Allard expects that within two or three years most racing cars will be driven by compact, power-packed gas-turbine units. Regular cars, he predicts, will have them in five to 10 years.

He has spent his life putting such new ideas to the test. "I've had accidents, but I've been lucky. After all, you have to get into accidents, don't you? Otherwise you'd never know the limits of your car. You have an accident and then the engineers figure out what must have happened. In racers, as in jet planes, theory follows practice. Any important improvement goes on sports cars first of all." END

First-Nightmare

Somebody once asked John Barrymore if he minded playing to an audience of empty heads, and the actor truthfully replied:

"Not at all, only empty seats."—*Wall Street Journal.*

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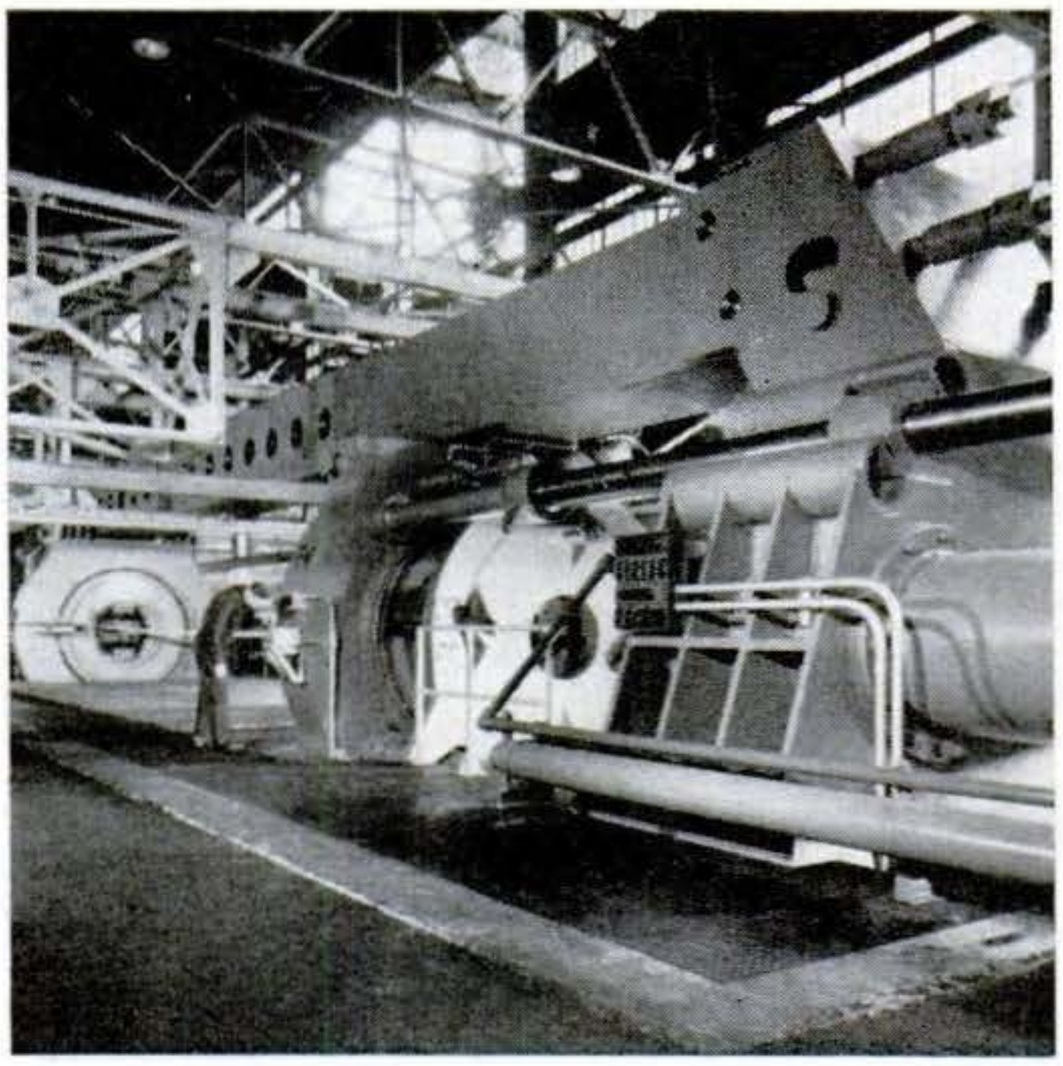

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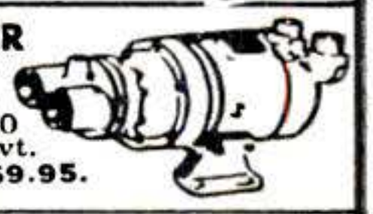

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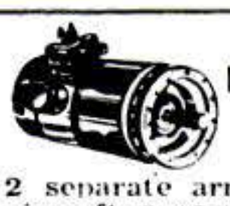

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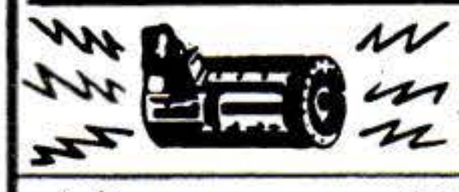

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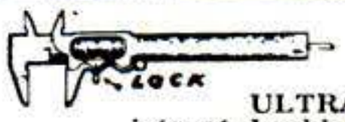

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Plaster Speeds Metal Casting

A NEW plaster process now makes the casting of the intricate aluminum blades for automobile torque converters faster and cheaper. Workers above are pouring plaster into core boxes to form mold components. Alcoa, which developed the process, claims that it can be used for many different types of metal parts.

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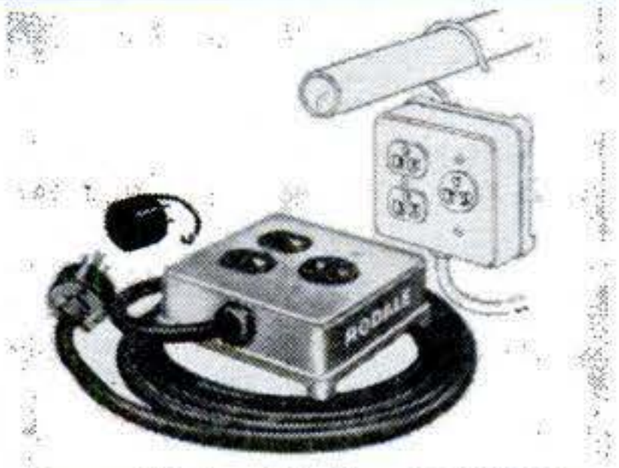

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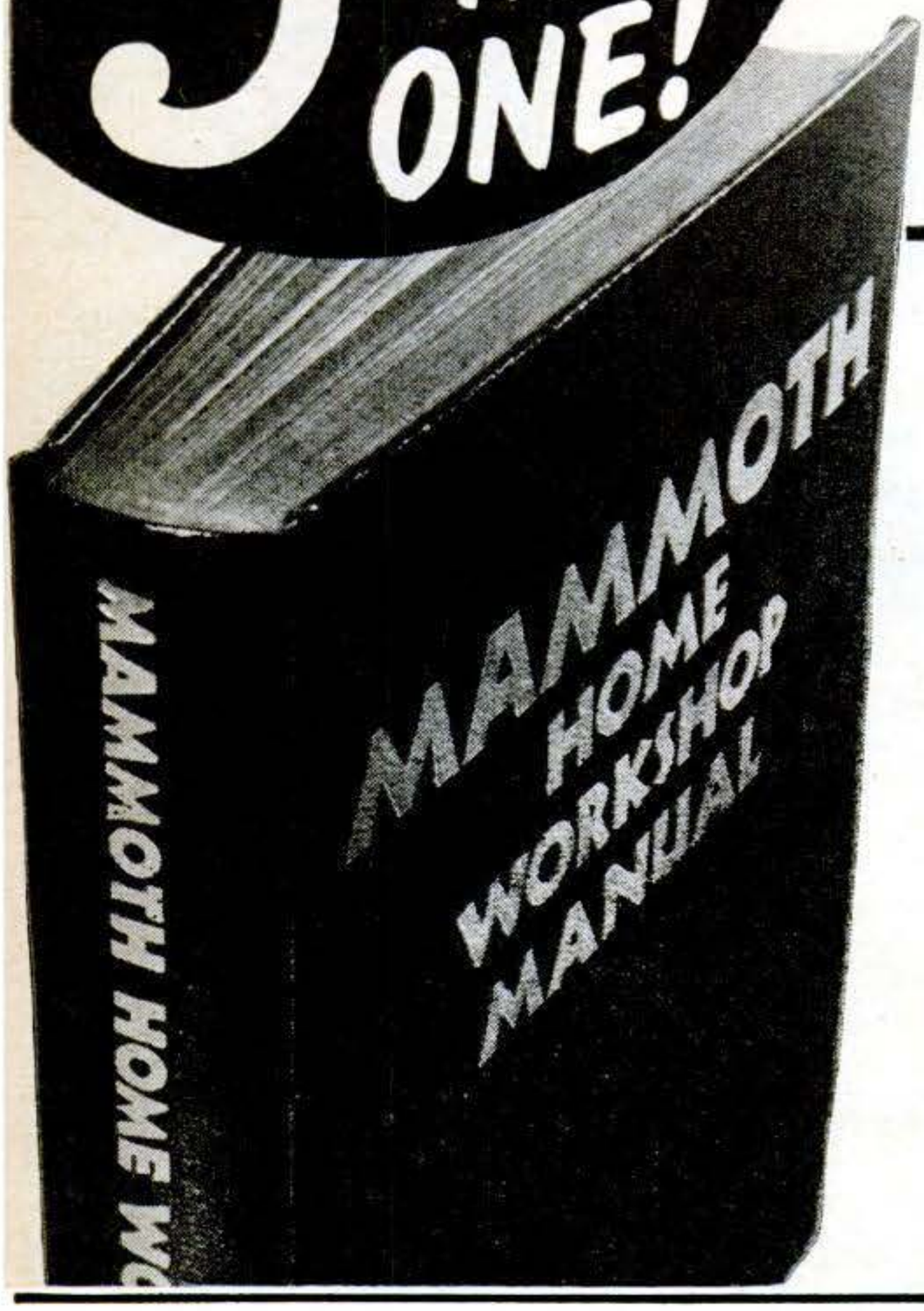

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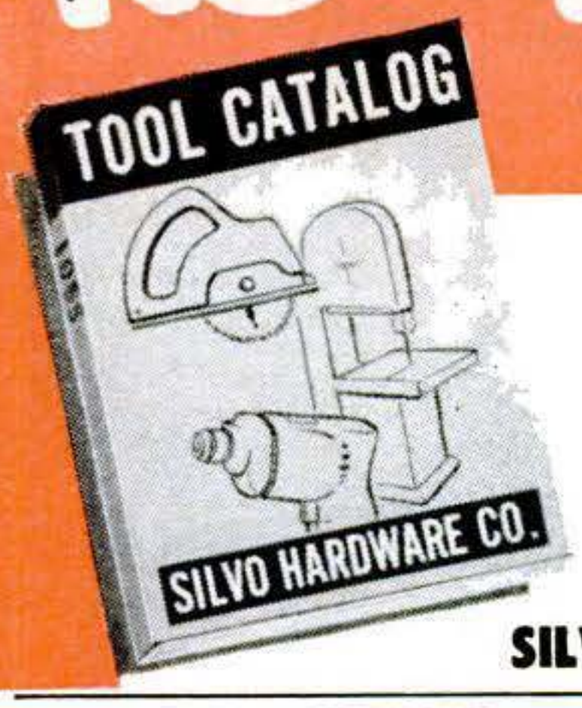

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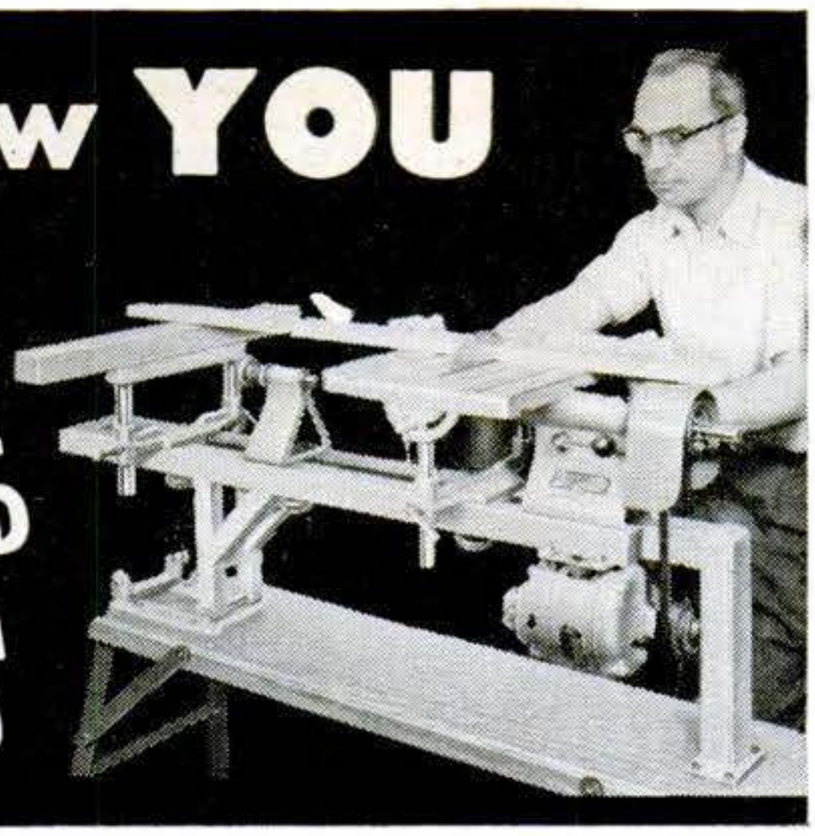

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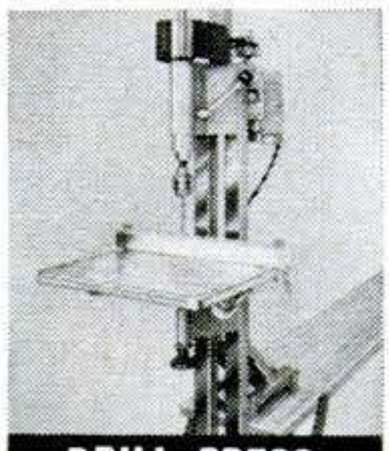

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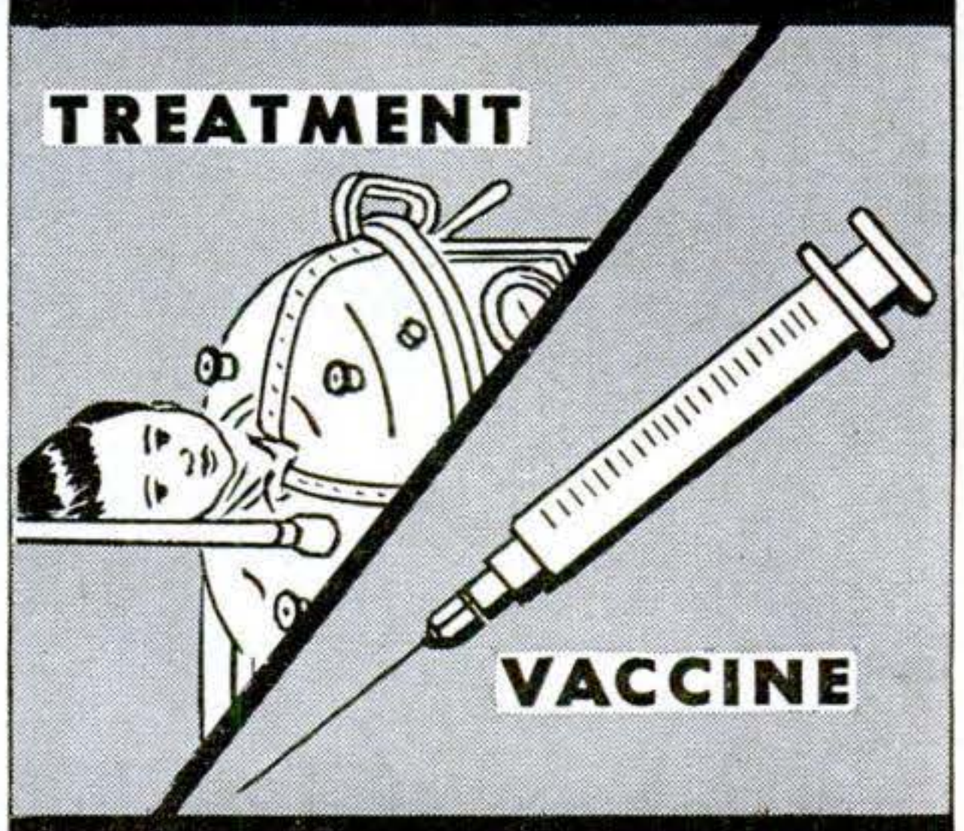

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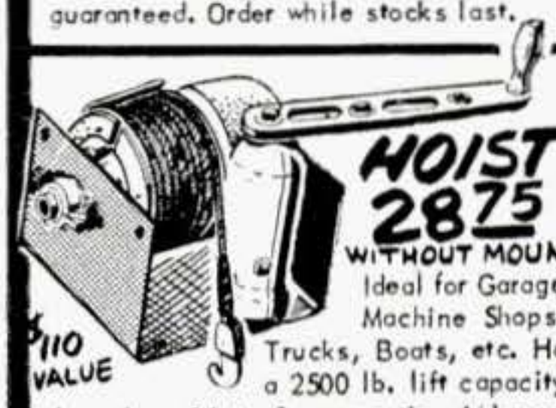

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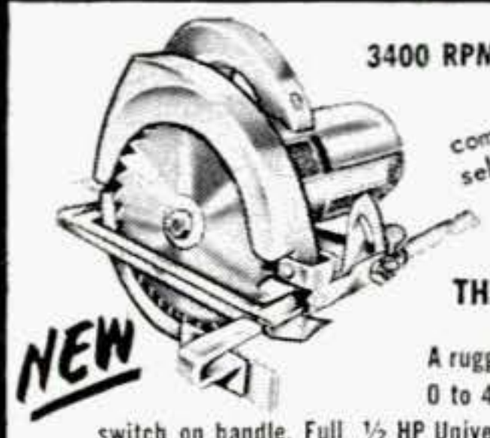

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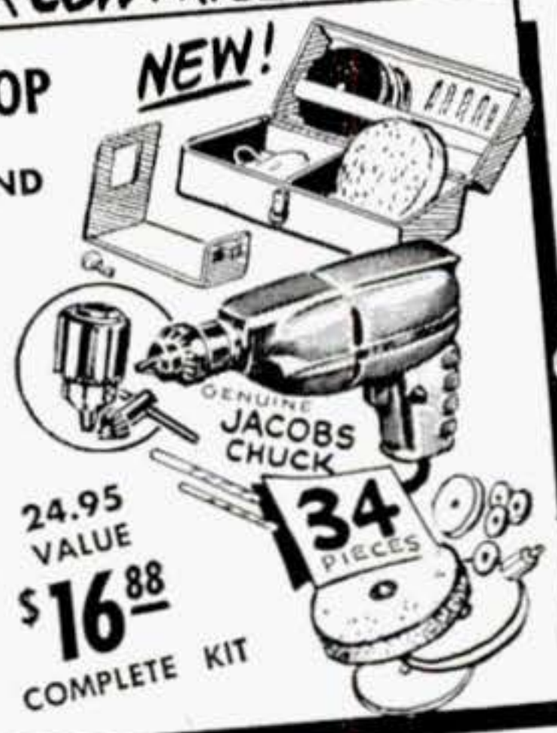

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Makes Surf or Deep Stream Fishing a real pleasure. Also ideal for use wherever it is necessary to protect the body or clothes from mud, silt, moisture, etc. Made to top Government specifications. Originally designed for use as an overboard suit in landing operations. Of heavy duty rubberized canvas with vulcanized seams. Has built-in rubber boots and gloves. Sizes: Medium and large. **9.95** 35.00 VALUE NEW

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Made to top Gov't specifications, of finest quality rubber with warm felt inner lining. Comes up to your chest. Have built-in boots, shoulder straps & vulcanized seams. $25.00 value. Sizes: Small, Med., Large. **7.95** NEW

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[*Continued from page 125*]

he invented the Imitation Ink Blot.

This consisted of a piece of blot-shaped felt, dyed black to look like spilled ink, plus a bottle that looked as if it had spilled the ink. You placed both bottle and blot together on your wife's finest tablecloth or bedspread and awaited her reaction. A new gimmick based on the same idea is the Imitation Nail Polish Stain.

Sam Gives Motorists the Needle

From the Ink Blot on, Adams' career became one darn thing after another. The nail in your tire, for instance. This is a huge spike with a tiny needle point that holds the spike onto the tire but does not penetrate. It looks like a flat just about to happen. There is a soap that dies your hands green. There is a toothpick with tooth attached.

Adams has provided for diners as thoroughly as he has provided for drinkers. On his menu are "the most realistic fried eggs you ever saw," made of plastic rubber. There are imitation cupcakes (rubber, frosted) and rubber chocolates. There is a device that consists of a long tube with a bulb at one end. You place the other end under someone's plate and, at an appropriate time, you press the bulb. The plate rattles. There is that angleworm you can drop in the salad. Here is Adams' catalogue description:

"Worm (plastic). A perfect imitation of a live angleworm. Great surprise when it shows up in a sandwich, salad, beverage, etc."

There is the fly in your sugar. You can buy Adams' life-size, realistic fly mounted on a pin (for sticking into sugar, cake, ice cream, etc.). Or you can buy a spoon with a fly on it.

Though he has hundreds of gags in the shops, Adams still figures he has to have a bunch of new ones each year to keep his Asbury Park, N.J., factory going, and to keep Americans unhappy. The weeks before April Fool's Day are his big season, and for 1955 he has prepared these new packages of trouble:

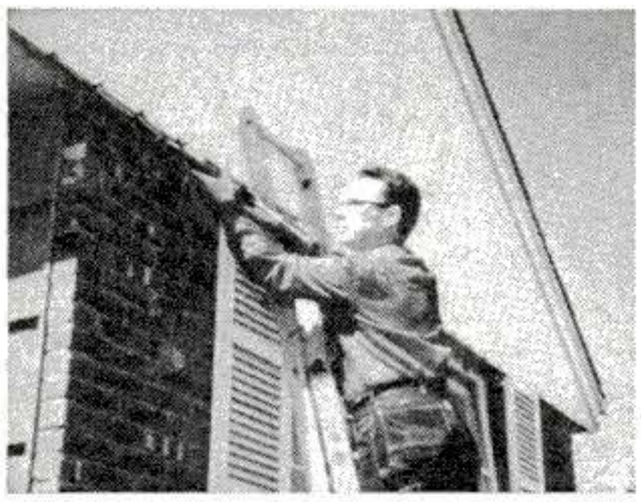
- A ball-point pen that explodes.
- A desk set that does ditto.
- A new brand of chewing gum: Pucker gum. It contains alum—puffs up your mouth and makes it difficult to talk.
- A pair of spectacles with one lens that makes one eye look much larger than the other. Name: the Evil Eye.

Adams now would like to climax his career with something even more colossal than the Joy Buzzer. He has in mind one possibility: a bathing suit that will dissolve as soon as it gets wet. END

Spring's Coming!

It's Time to Brighten Up Your House

NEXT MONTH . . . You'll find a special section devoted to new, down-to-earth ways of glamorizing your home with sparkling color—without blowing your bank roll. There will be 16 pages—many in full color—reporting new materials and telling how to use them—in Popular Science Monthly.



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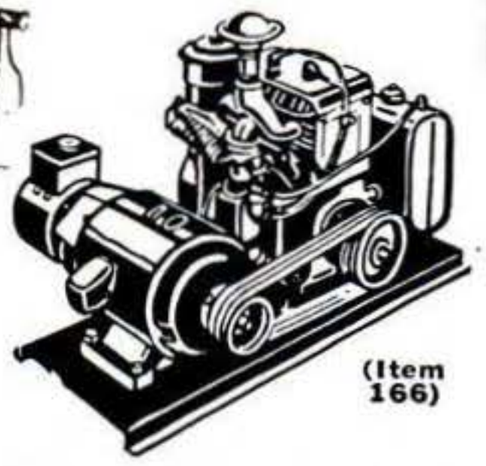


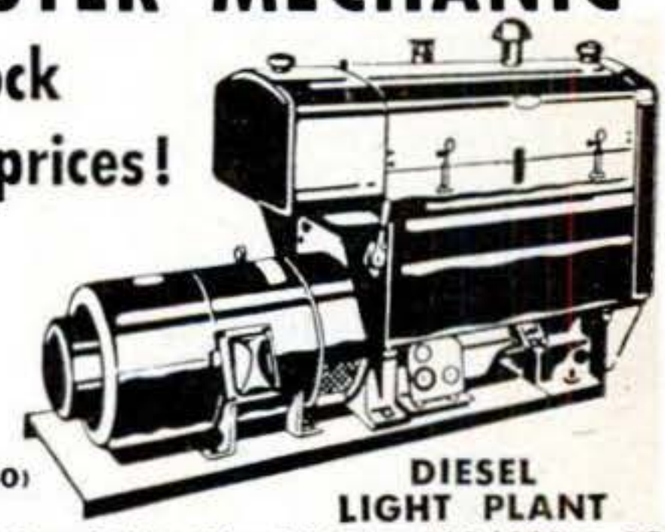
(Item 166)

HI LINE 6000 WATT PLANT

HEAVY DUTY—110/220 v. 60 cyc. AC. A brute of a power plant with a rugged 14.6 hp. Wisconsin engine. Affords both 110 & 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Item 166. Easily worth $995. With crank start **$585.00**

Same plant, but with **self-starter** (Item 162) **$645.00**

Generator & control box only, Belt driven. Wt. 240 lbs. Item 163 **$345.00**



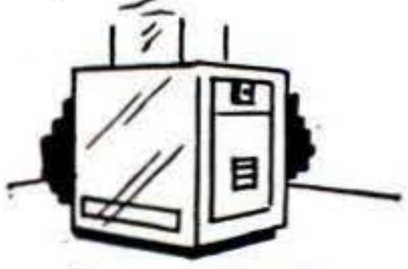
(Item 1660)

DIESEL LIGHT PLANT

11-12 KW (Item 1660) Diesel Master 110/220 v. AC single or 3 phase. 1800 rpm direct connected. Electric self-starting. Engineered for permanent power where continuous low-cost heavy duty service is important. Wt. 1350 lb. Reg. list $3650.00. Factory price..... **$1895.00**

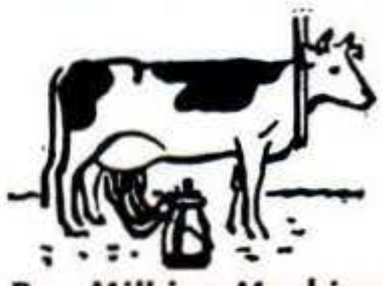
GAS DRIVEN PLANT 10-11 kw. 110/220 v. 60 cyc. AC single or 3 phase, powered by a 4 cyl. Wisconsin air cooled engine. Belt driven—simple reliable 5 V-belt drive. Mounted on rugged steel skid. (Item 217) (with crank start) Wt. 900 lbs. Factory price **$1075.00**

Same plant with **self-starter**.....$1145.00



Operate Heating Plants

Keep Freezers Going



Run Milking Machines

Power failure need not be a disaster!

Instant starting MASTER MECHANIC light plants provide electricity immediately . . . keep oil burners, water pumps, milking machines and food freezers in operation. Don't risk costly freeze-ups, meat spoilage, blackouts and other vital machinery stoppages. Master Mechanic's direct from factory prices make it possible for *every one* to have the insurance of uninterrupted electric power, regardless of storm, tornado or hurricane!

And you can have power wherever you want it! Master Mechanic's portable plants can be taken anywhere . . to provide standard 115 volt, AC power to operate saws, drills, chain saws, floodlights, etc. . . on building construction, road work or in the woods!

GIANT 2000-2500 WATT PLANT

(Item 31)

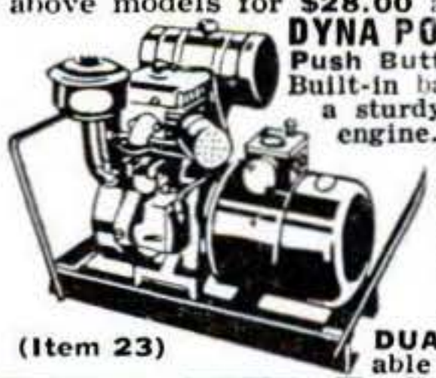
110/120 v. 60 cyc. AC. Exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted —portable. Powered by an easy starting Briggs or Wisconsin 6 hp engine—easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Item 31. Wt. 210 lbs. Reg. $585. Special..... **$299.50**

Same plant with electric self-starter. Item 31a **$359.50**

Generator only and control box.....**$169.50**

DUAL VOLTAGE—110/220 available on any of the above models for **$28.00** additional.

DYNA POWER 3500 WATT PLANT



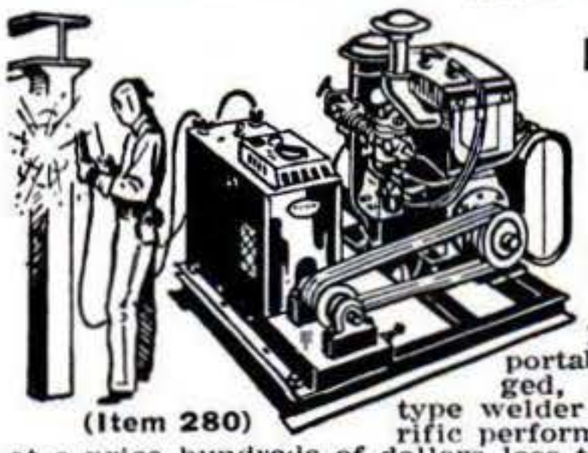
(Item 23)

Push Button Start. 115 v 60 cyc. AC. Built-in battery charging. Powered by a sturdy 8 hp air-cooled Wisconsin engine. Built for continuous duty, yet compact and portable. Integral positive drive—an exclusive Master Mechanic feature. Includes control box, plug-in power receptacle and voltmeter. Item 23. Wt. 270 lb. Factory spec... **$379.50**

DUAL VOLTAGE—110/220 available for **$20.00** additional.

Any of our plants may be equipped to operate automatically if desired

WRITE FOR DETAILS!



(Item 280)

MASTER DC ARC WELDERS

Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. You can pay more, but you can't buy a better welder.

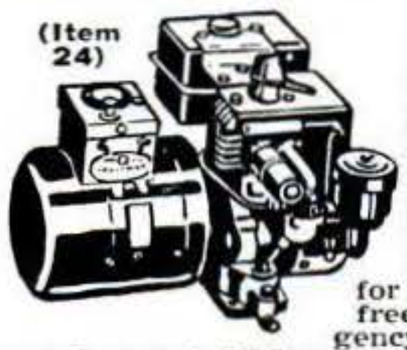
WELDER ONLY — DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a.) Wt. 110 lbs. $450 value..... **$119.50**

WELDER ONLY—STANDARD MODEL. Same as above but with single rheostat for heavy metal welding only. (Item 38.) Wt. 110 lbs. $400 value. Special.. **$99.75**

COMPLETE POWER MASTER (Illustrated above) powered by a 14.6 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing $1200. Special for January only..... **$399.50**

WELDING KIT, Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder.....**$10.50**

MASTER PORTABLE LIGHT PLANTS



(Item 24)

ELECTRA LITE 600-700 WATT

Push Button Start 115 v. 60 cyc. AC. Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. $275. value. **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output **$199.50**

Little Giant 350 Watt Plant

Imagine—65 compact pounds of portable power that goes with you anywhere—easier to carry than an outboard motor. Provides plenty of current for lights, radios, small power tools, electric shavers, etc. Perfect for hunters, campers, contractor's service trucks, etc. 350 watts, 115 v. DC. Ruggedly constructed with 1½ HP Briggs engine. List price $224.75. Item 273. Spec. factory price..... **$99.75**

(Item 20)

PORTO POWER 1500-1750 WATT

115 v. 60 cyc. AC. **Push button start.** Powered by a 4.5 HP Briggs engine. Combines compactness and easy portability with higher output for handling heavier starting loads. Built-in winding for charging 12 v. batteries. An ideal standby power plant for operating oil burners, sump pumps, freezers, television, lights, communication systems, etc. Perfect for contractor's power tools. Item 20 Wt. 146 lbs. Factory Special. **$279.50**

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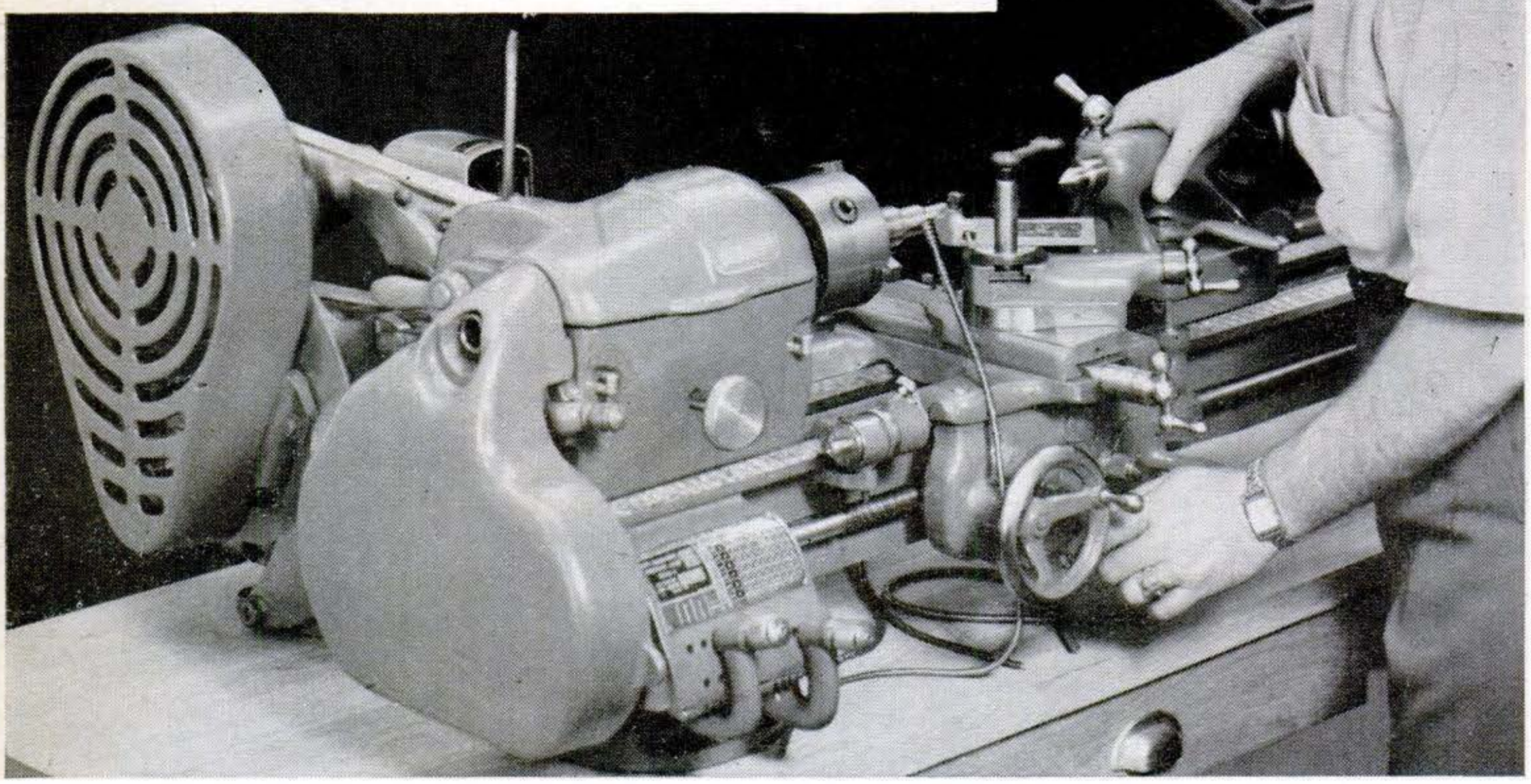

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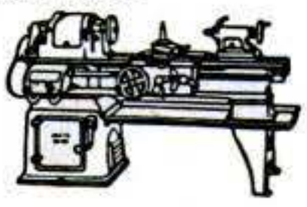
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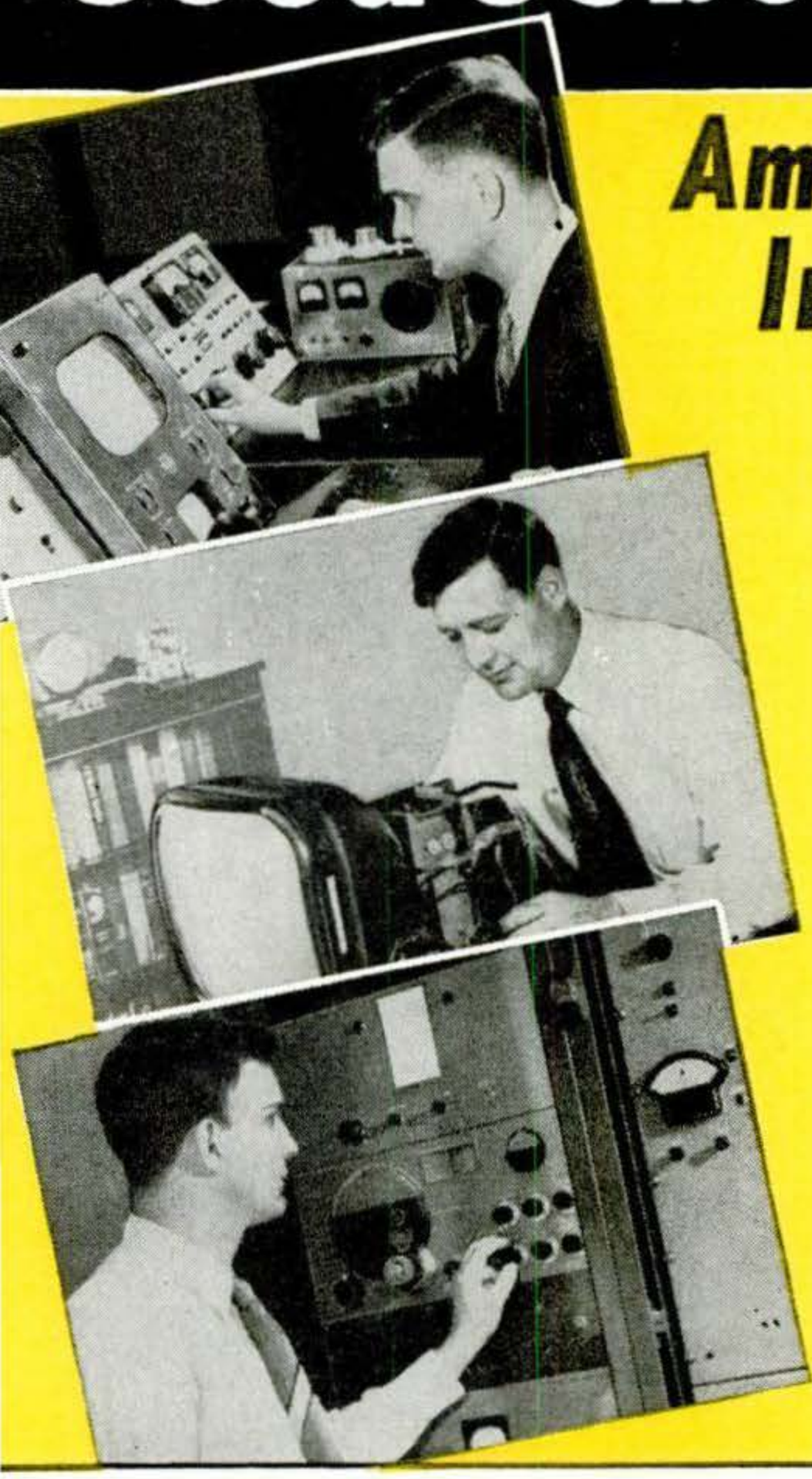

America's Fast-Growing Industry Offers You

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Keep your job while training at home. Many NRI students make $10, $15 a week extra fixing neighbors' sets in spare time, starting soon after enrolling. The day you enroll I start sending you special booklets that show you how to fix sets. You use the Multitester built with equipment I furnish to locate and correct set troubles. Adam Kramlik, Jr., Sumneytown, Pa., wrote: "Earned $12 to $15 a week, spare time. Now have my own Radio-TV shop."

2. GOOD PAY JOB

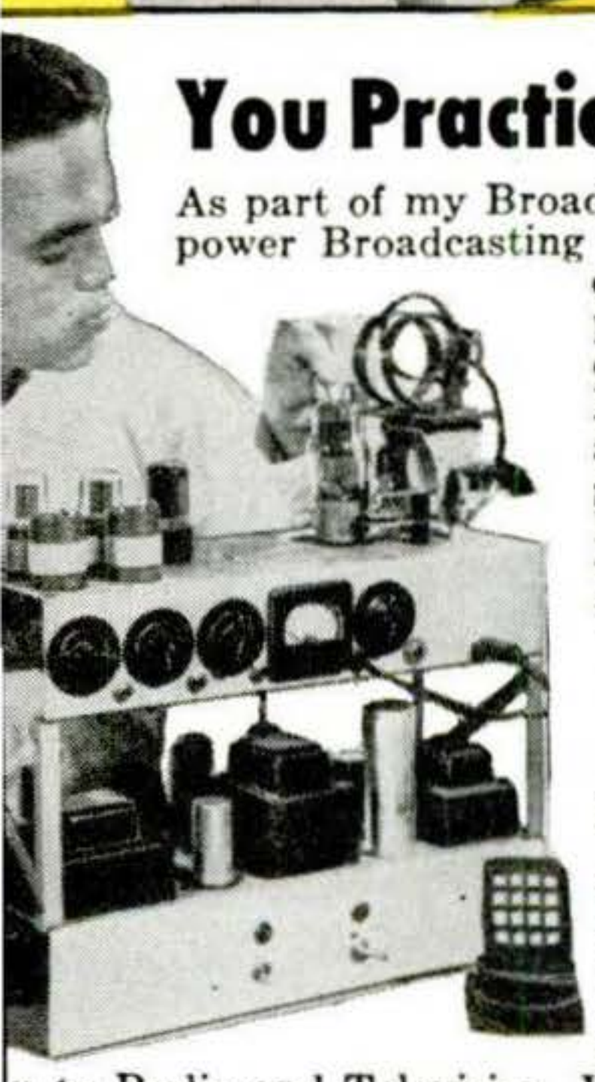
Radio-Television growth and expansion and new uses for known principles are making more jobs for well-trained men. There are over 3000 Radio Broadcasting Stations on the air giving good pay to operators, technicians. Over 115 million home and auto Radios are now in use, providing full time and spare time servicing opportunities. Government, Aviation, Police, Ship, Micro-wave Relay, Two-way Radio Communications for buses, taxis, trucks, railroads are growing fields of opportunity.

3. BRIGHT FUTURE

About 200 Television stations are now on the air from coast-to-coast. Hundreds more being built and hundreds of others authorized. These new stations will need operators, technicians. More than 25 million Television sets are already in use and require servicing. Thousands more Television sets are being sold every week and need installation, servicing. Act now to qualify for a good job or your own sales and service business. Cash in on this rapid growth.

Television is Making Good Jobs, Prosperity

Training plus opportunity is the PERFECT COMBINATION for job security, advancement. When times are good, the trained man makes the BETTER PAY, gets PROMOTED. When jobs are scarce, the trained man enjoys GREATER SECURITY. NRI training can help assure you and your family more of the better things of life. My training is practical, complete; is backed by 40 years of success training men at home. My well illustrated lessons give you basic principles you need and my skillfully developed kits of parts "bring to life" things you learn from the lessons.



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Without obligating you in any way, I'll send an Actual Lesson to prove that training at home is practical. I'll send my 64-page book to show good job opportunities for you in Radio-Television, show equipment you build, show what my graduates are doing and earning. Terms for NRI training are as low as $5 a month. Many graduates make more in two weeks than the total cost of my training. Mail coupon now. J. E. SMITH, President, National Radio Institute. Dept. 5AB, Washington 9, D. C. OUR 40TH YEAR.

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